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ABSTRACT

Integrated Pest Management (IPM), a decision-making approach to pest control, is designed to help individuals decide if pest suppression treatments are necessary, when they should be initiated, where they should be applied, and what strategy/mix of tatics to use. IPM combines a variety of approaches with which to manage pests, including human behavior changes, habitat modification, physical controls, biological control agents, and least toxic chemical controls. Using these techniques, an IPM program maintains the size of a pest population at or below an acceptable level. In addition, the amount of toxic material put into the environment is kept as small as possible. This module contains basic information/materials necessary to begin an IPM program on cockroach control that best suits the needs/resources of each specific teaching situation. Materials provided include: an introduction; teaching suggestions; eight lesson plans (focusing on basic concepts of habitat, environment, food/waste management, and pests); take-home booklet depicting steps in controlling cockroaches in a home kitchen; script for a filmstrip/sound cassette package; set of 16 posters leading through a step-by-step explanation of how to make a room less attractive to cockroaches; glossary; and bibliography. Although designed for elementary students, posters and filmstrip program may be useful/valuable for adults. (JN)

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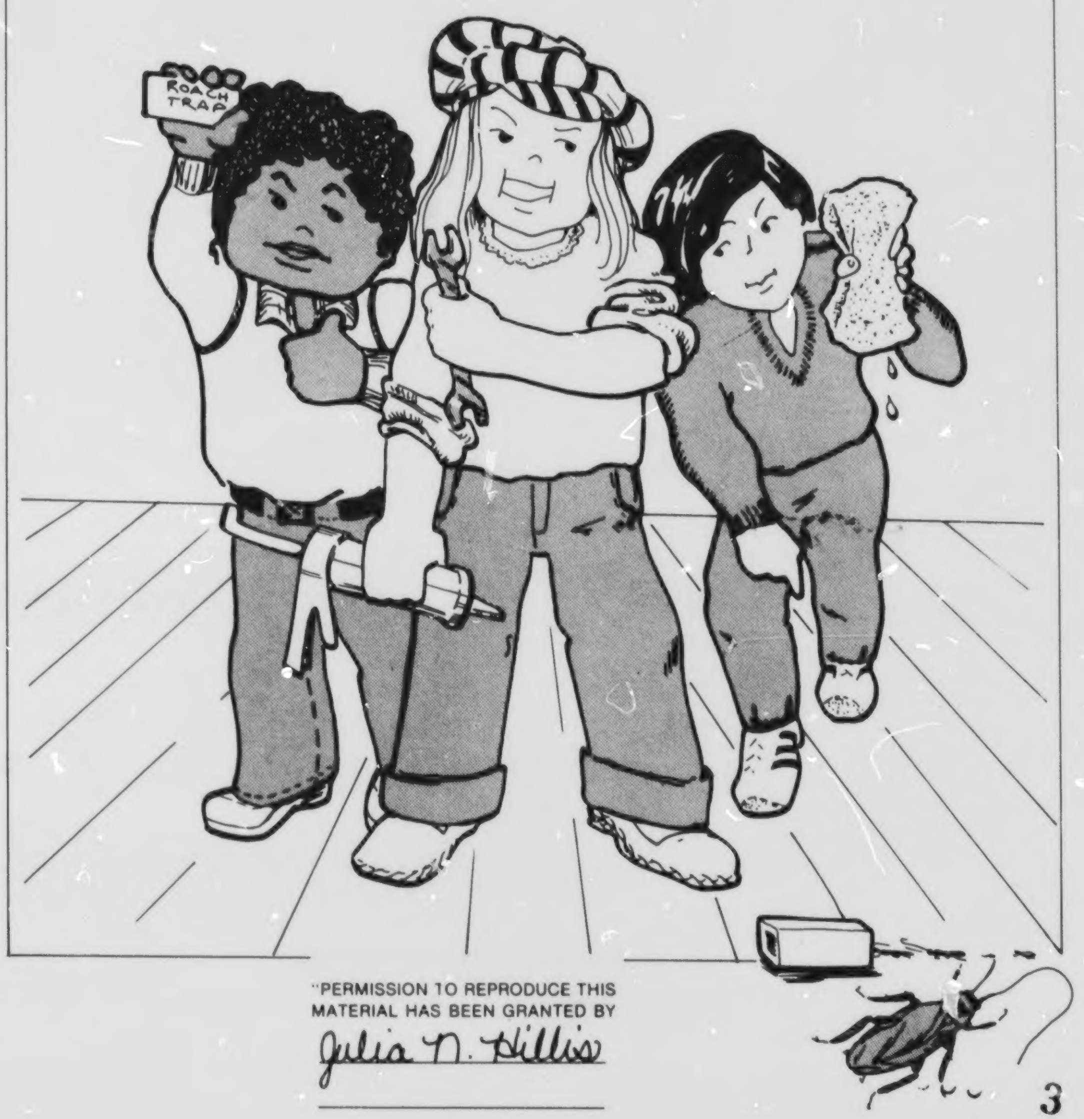
COCKROACH CLEAN-UP TOUR

Urban Pest Management

Teaching Environmental Living Skills to
Elementary Students

by Kathleen Letcher Cowles
Illustrated by Jean Pajot Smith

Produced by the John Muir Institute
with funds provided by the
Charles Stewart Mott Foundation



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URBAN PEST MANAGEMENT

Teaching Environmental Living Skills
to Elementary Students

The Cockroach

Clean-Up Tour

Kathleen Letcher Cowles

Illustrated by Jean Pajot Smith

Produced by
The John Muir Institute for Environmental Studies, Inc.

With funds provided by
The Charles Stewart Mott Foundation

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The interpretations and conclusions contained in this publication represent the views of the grantee and not necessarily those of the Mott Foundation, its trustees, or officers.

BASIC COCKROACH MODULE

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Introduction

Their house is clean and well-maintained, but they have weevils in the flour, roaches in the cupboards and mice in the basement. The pest company came in and sprayed two weeks ago, but the bugs are back. They worry about the side effects of pesticide spray, but nobody ever taught them how to get rid of pests. **What can they do?**

Every city (and rural) resident has to deal with a variety of pests in daily life: roaches, hornets, headlice, fleas, rats, ants—the list can seem almost endless. Unfortunately, few people ever receive any scientifically-based training on how to control these pests. Pesticide sprays often seem the only "solution", but often are accompanied by the undesirable side-effects of acute or chronic poisoning and pests that eventually become resistant ("immune") to the pesticide.

Another method of controlling these pests is **Integrated Pest Management** (IPM). As the name implies, IPM is a method of managing pests that combines a variety of approaches, including human behavior changes, habitat modification, physical controls, biological controls, and least-toxic chemical controls. The purpose of an IPM program is to keep the size of the pest population at or below an acceptable limit while minimizing the amount of toxic material put into the environment.

IPM is a simple, common-sense approach to pest control – one does not need to be an "expert" to understand it or to teach it. But it **does** need to be taught to the students of today if we are to have healthy and pleasant cities in the future.

This module (described in more detail later in this section) is an attempt to present basic IPM techniques in a format that can fit easily into any teacher's schedule. Background information is provided with each lesson so that no scientific expertise is required to present the material. The module can be taught as a whole or sections can be taught separately. It has been designed to encourage strong parental involvement in an attempt to communicate these skills to adults who may also need them. Although the materials are primarily aimed at the K-6 level, adults will find the guided walk and filmstrip program interesting and valuable as well.

Module Contents

This envelope contains basic information and materials necessary to begin a program that best suits the needs and resources of each specific teaching situation. The enclosed materials include an introduction, teaching suggestions, eight lesson plans, a glossary and bibliography, and samples of a take-home booklet, innovative "guided walk" poster, and the script for a filmstrip/sound cassette package. Additional take-home booklets, a complete set of guided walk posters and/or the color filmstrip (with accompanying 8 min. cassette tape) can be ordered on the form found at the back of this packet.

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Description of Available Materials

The following components are available for use in the presentation of this module:

1. **Guided Walk:** a set of 16 posters that can be displayed on any wall – preferably in a large school bathroom. The guided walk leads students through a step-by-step explanation of how to make a room less attractive to cockroaches.

2. **Filmstrip** with accompanying sound tape cassette (8 min., color): illustrates an IPM program for cockroaches in the home.

3. **"My Very Own" Take-Home Booklet:** simple line-drawings depicting each step in controlling cockroaches in a home kitchen.

4. **Eight Lessons:** teach the basic concepts of Habitat, Environment, Food/Waste Management, and Pests. Each lesson is designed to strengthen skills in one or more subject areas. Abundant background information, activity suggestions, discussion topics and Extension/Variation possibilities are included. The teacher is encouraged to study the materials beforehand and then adjust his/her presentation to reflect the interests and capabilities of the students actually participating in the lesson. A quiz is included with each lesson to be used as an evaluative tool where needed. (The attached "Curriculum Description" presents the educational structure of the Lessons in more detail.)

How to Teach This Module

The module can be presented in its entirety or any of the components can be presented separately. The lesson plans (and reproducible handouts) by themselves present significant information on cockroaches and the environmental factors important to their management. However, for maximum effectiveness, it is suggested that the entire module be presented over a four-week period. The suggested schedule presents the guided walk, the filmstrip program, and the take-home booklet at the beginning of the month, and two lessons each week (in the same afternoon if necessary) for the entire four-week period. The program closes with a summary discussion and an open house (where completed work and projects can be displayed for the entire school and parents).

Parents can be encouraged to participate through a letter sent home with each student on the first day of the program. This letter should explain the program, invite the parents to attend the filmstrip presentation later that week, and encourage them to attend the open house at the end of the program. (A sample of a letter that might be used is attached.) A special evening viewing of the filmstrip or guided walk could also help encourage participation.

SAMPLE LETTER TO PARENTS

Dear Parents:

We will soon be starting a new program that we hope you and your child will enjoy participating in. This program will teach non-poisonous ways to control household pests (especially cockroaches) at the same time that it teaches basic skills in reading, writing, mathematics and science.

We invite you to join us in the viewing of a filmstrip that will introduce this program on ___(date)___ at ___(time)___ here at ___(elem. school)___ ; room ___(#)___ . We also encourage you to review with your child the take-home booklet that he/she brought home today.

Finally, the class and I warmly invite you to attend our Open House on ___(date)___ at ___(time)___ in the same room. We will be displaying our completed projects and drawings for you to enjoy.

Please contact me if you have any questions about this exciting new material. We look forward to exploring it with you next month.

Sincerely,

Suggested Schedule

1. **FIRST WEEK:**	
Beginning of week	• Present filmstrip program. • Distribute take-home booklet. • Distribute letter to parents.
Middle of week	• Present guided walk.
End of week	• Lesson #1 ("It's a Roach's Life") • Lesson #2 ("Monitoring for Cockroaches") • Lesson #3 ("What's Bugging You?")
2. **SECOND WEEK:**	• Lesson #4 ("Finish the Story") • Lesson #5 ("Are you 'Wasting' Away?")
3. **THIRD WEEK:**	• Lesson #6 ("What's in a Home?")
4. **FOURTH WEEK:**	
Beginning of week	• Lesson #7 ("Choose Your Environment") • Lesson #8 ("My Neighborhood Network")
End of week	• Summary discussion • Examine returned check-lists (from take-home booklets). • Parent visit and Open House

Background: Why This Module Was Developed

This module is the result of a project that has been exploring ways to introduce new pest control techniques to the general public. Funded by a four-year grant from the Charles Stewart Mott Foundation, employees of the John Muir Institute for Environmental Studies have been developing a pilot pest management program in schools in Flint, Michigan and Washington, D.C.

The pilot program has four steps: to reduce pests in one elementary school by using an Integrated Pest Management program, to develop curriculum materials based upon this program, to use the successful reduction of pests in the school to advertise the program to neighborhood residents, and then to build the program into the city's structure so that it will endure when the project itself is completed. A final goal of the project is to develop a generic model for presenting IPM to any school, elementary student, and neighborhood in the country.

IPM in the School: It Really Works!

The first step in any IPM program is to **monitor** the pest in order to establish the type, location and numbers of that pest. In the pilot program, monitoring was performed with cockroach traps in both the Flint and Washington D.C. schools. Both schools showed high levels of German cockroach infestation despite monthly treatments with pesticide spray.

Spray operations were halted and a clean-up campaign was initiated. In the Flint school, monitoring data showed that 83% of the roaches trapped were located in one basement bathroom. Cleaning, dusting boric acid into the wall cracks, and caulking reduced the roach population in that bathroom—and subsequently, in the entire school. Roach population levels remained low at the school for the duration of the IPM program without the use of pesticide spray treatments. The following chart illustrates the success of this program:

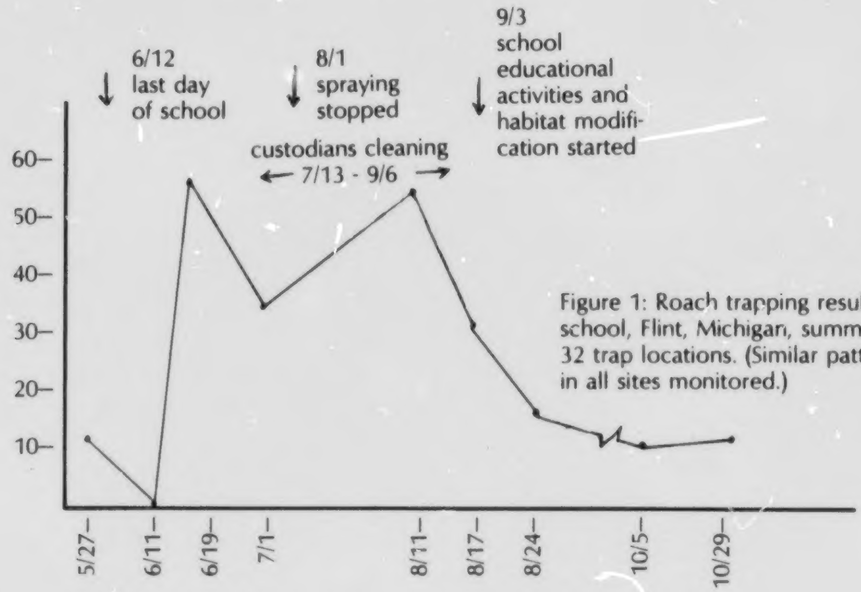

Figure 1: Roach trapping results, Cook elementary school, Flint, Michigan, summer, 1981.
32 trap locations. (Similar patterns were observed in all sites monitored.)

In the Washington, D.C. school, the German cockroach population declined by 80% in the first year of the program. The only "treatments" used thereafter were improved food and waste management.

IPM in YOUR School: Developing Your Own Program

The presentation of Integrated Pest Management ideas to people in a school system often results in a flurry of interest. Increased awareness of the fact that pests can be controlled without the usual hazard and cost of pesticide sprays invariably leads people to ask why this new approach to pest control hasn't already been adopted by the school district.

In its work with school administrations, JMI has received many answers to that question. Most of them have to do with the simple fact that everyone is **accustomed** to doing it "the old way"; that's how the pest control contracts were written, that's how the custodian job descriptions were worded, and that's what everybody expects.

However, a growing body of information is available to help administrators, teachers and/or parents change their school's pest control program to one that can be safer, less expensive and more effective. A partial list of publications available from the John Muir Institute is located in the Bibliography. Please write or call for more information or to share your comments on the Cockroach Educational Module.

CURRICULUM DESCRIPTION

Central Theme: Pests, like all other organisms, can only exist within an environment that meets their needs.

Goal: Pests can be safely and effectively controlled by changing their environments so that the environments do not meet the pests' needs.

Concept: Controlling cockroaches requires an understanding of their biology.

Lesson 1: "It's a Roach's Life"

Objective:
Recognize German cockroaches in all life stages

Lesson 2: "Monitoring for Cockroaches"

Objectives:
1) Demonstrate understanding of German cockroach biology by showing proper trap locations.
2) Collect data on monitoring form.
3) Display on line graph.

Concept: Removing the necessary components of a pest's habitat reduces the pest.

Lesson 3: "What's Bugging You–And Why?"

Objectives:
1) Demonstrate a basic understanding of key words involved in cockroach habitat modification.
2) Identify necessary components of a cockroach's habitat.

Lesson 6: "What's in a Home?"

Objectives:
1) Name three necessary components of any organism's habitat.
2) Give specific examples of these components for the cockroach.
3) Suggest ways to remove these components.

Concept: Proper food/waste management reduces pests by reducing the food available to them.

Lesson 4: "Finish the Story"

Objectives:
1) Identify pest-supportive situations in a home.
2) Suggest appropriate remedies.

Lesson 5: "Are You 'Wasting' Away?"

Objectives:
1) Differentiate between different types of garbage.
2) Identify types most likely to attract pests.
3) Describe ways to discourage pests.
4) Record quantities on a simple bar graph.

Concept: An environmental system is made up of many interconnected organisms that support one another. Humans can change an environment to make it more or less supportive of themselves or any other organism.

Lesson 7: "Choose Your Environment"

Objectives:
1) Describe a preferred environment and one that is unpreferable.
2) Describe a cockroach's preferred environment.
3) Describe ways to change this environment into one that is preferable to humans.

Lesson 8: "My Neighborhood Network"

Objectives:
1) Name three components of the urban environment
2) Discuss the role of each component.
3) Discuss the interconnectedness of each component.

Boric Acid:

How It Works; How To Use It

Serious infestations of roaches may require insecticide use in addition to the removal of the insects' food sources and hiding places ("habitat modification"). Safety, effectiveness, and pest resistance are the main factors to consider in selecting a poison. Cockroaches are repelled by pesticides they can smell but are least repelled by boric acid (BA) and have not developed resistance in over 10 years of use.

Boric acid powder is most effective when applied as a dust. The simplest way to do this is to "poof" it into cracks through the nozzle of a plastic container. (Many of the available BA products are packaged in containers of this type, but those that aren't can be transferred to a well-labeled plastic ketchup bottle.) Roaches walk through the dust and ingest the material while cleaning themselves. Thereafter, BA operates slowly, killing in 7 to 14 days. BA dust should be applied where habitat modification is difficult—around the stove and refrigerator or in particularly difficult cracks.

Boric acid applied as a dust does not really vaporize; thus it doesn't mix with the air that humans breathe. This characteristic alone makes BA much less harmful to the human environment than pesticidal sprays. However, although BA is much less toxic than most of the other available pesticides, it is still a poison and must be used and stored with caution. (About one ingested tablespoon can kill a child.) BA can also be absorbed through skin lesions or respired. Wear a dust mask if application methods throw boric acid dust into the air. Keep boric acid away from food, children, and pets. Label and seal storage containers carefully.

Resist temptation to turn to an insecticide as an easy way to avoid necessary habitat modification. Make the needed permanent changes in the environment first; then use an insecticide, if the changes alone are not sufficient.

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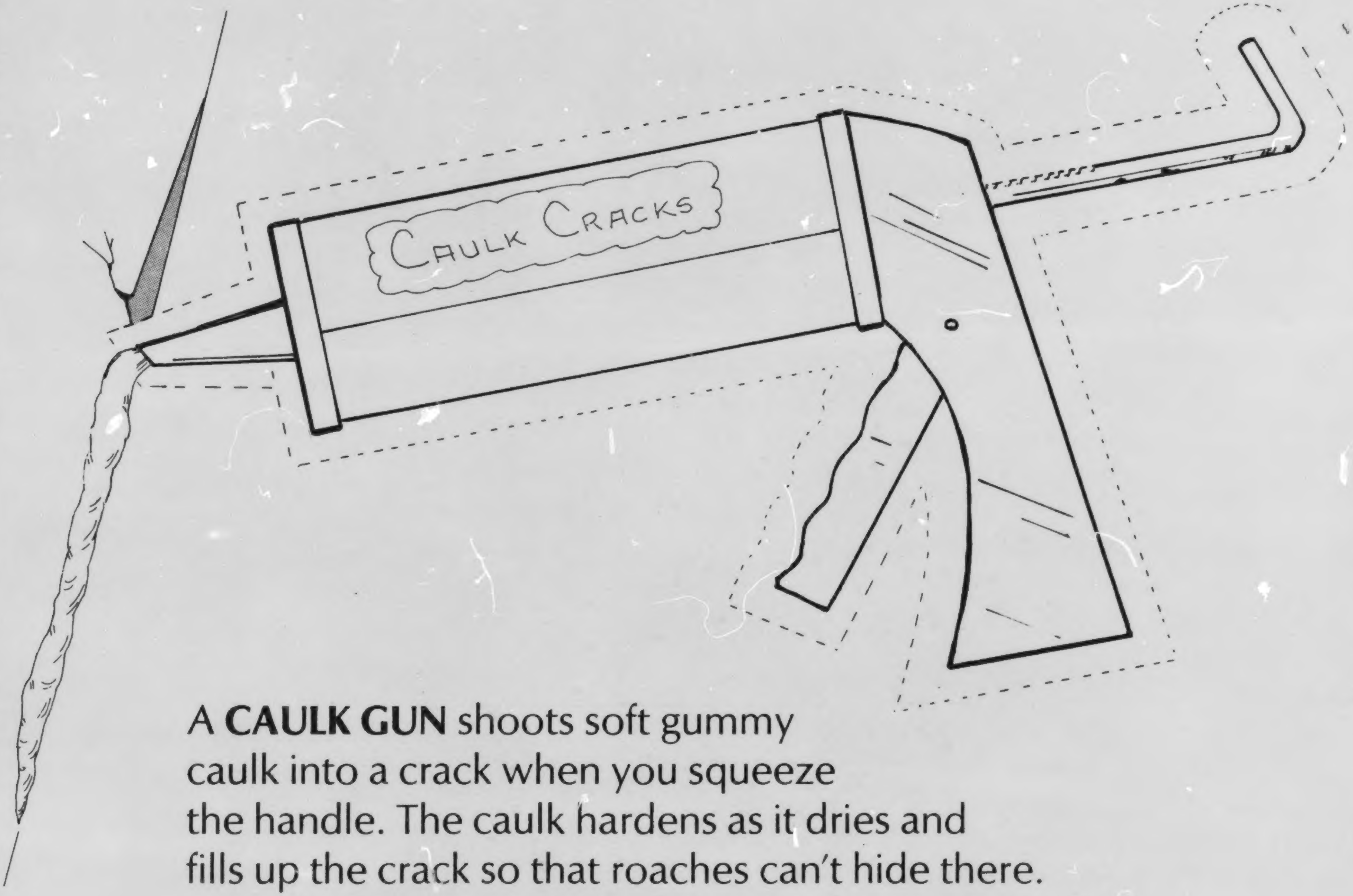
TOOLS

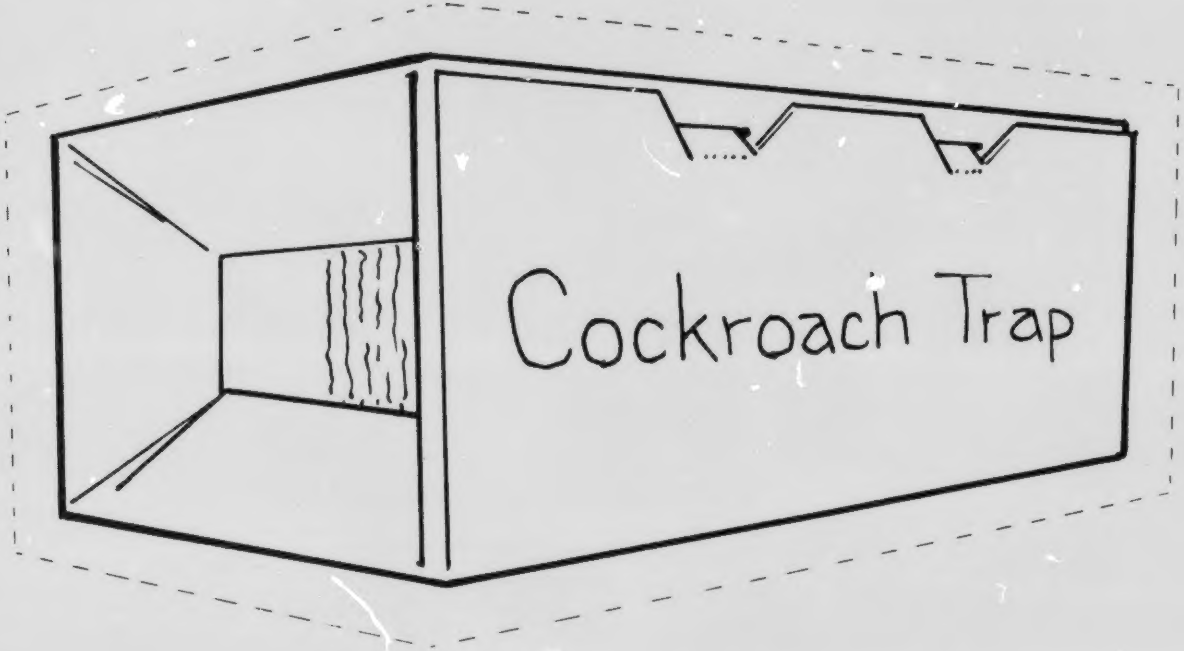
INSTRUCTIONS TO TEACHER:

Cut-out the "tools" on the following four pages. Each page also has a description of the "tool" and instructions on its use in cockroach control. Discuss each "tool" and its use with your class. Return to the bathroom with the "tools" after this discussion and have students tape them in the places where real tools would be used.

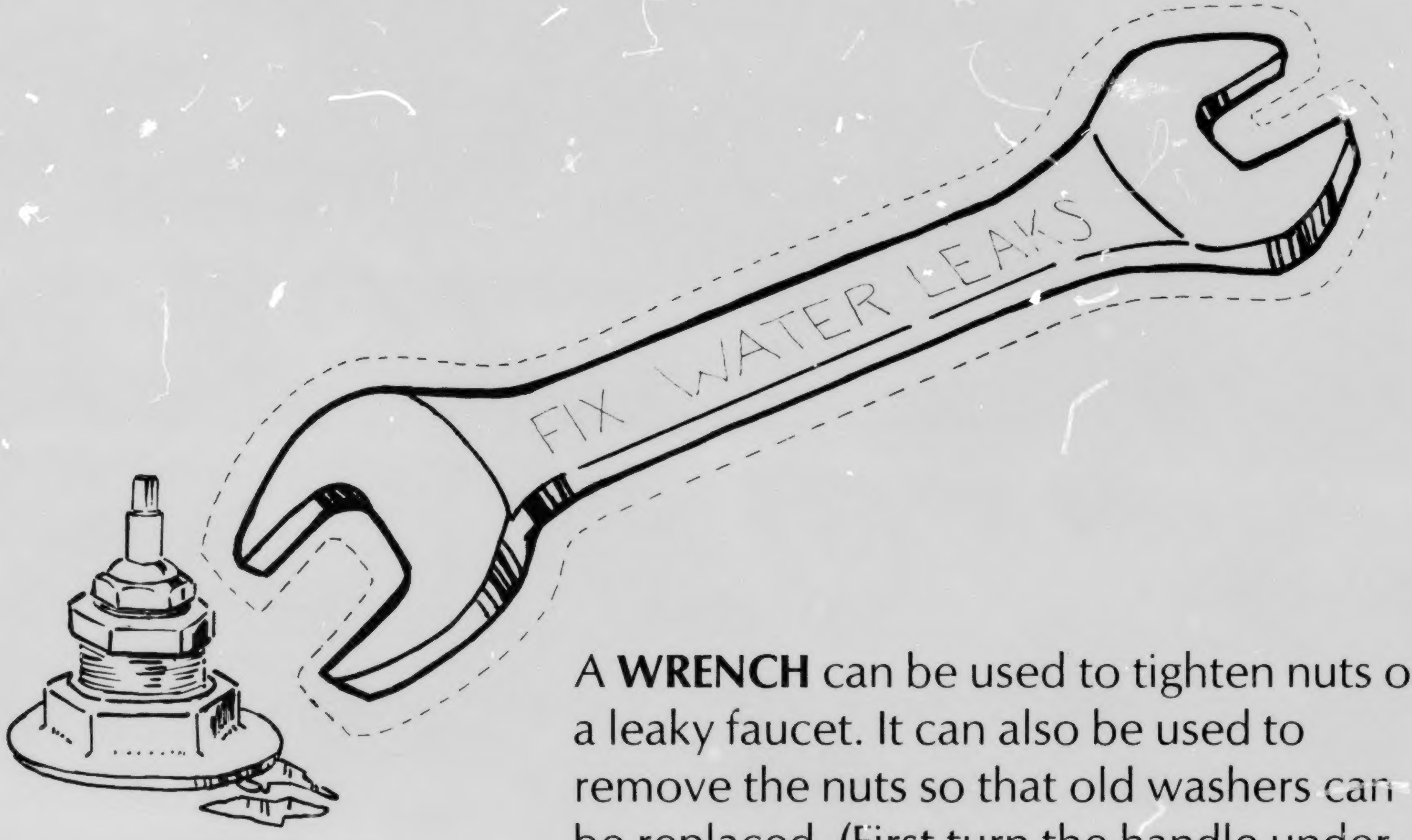
NOTE: A valuable additional learning experience would be to bring actual tools of this type to class and demonstrate their uses.



A **CAULK GUN** shoots soft gummy caulk into a crack when you squeeze the handle. The caulk hardens as it dries and fills up the crack so that roaches can't hide there.

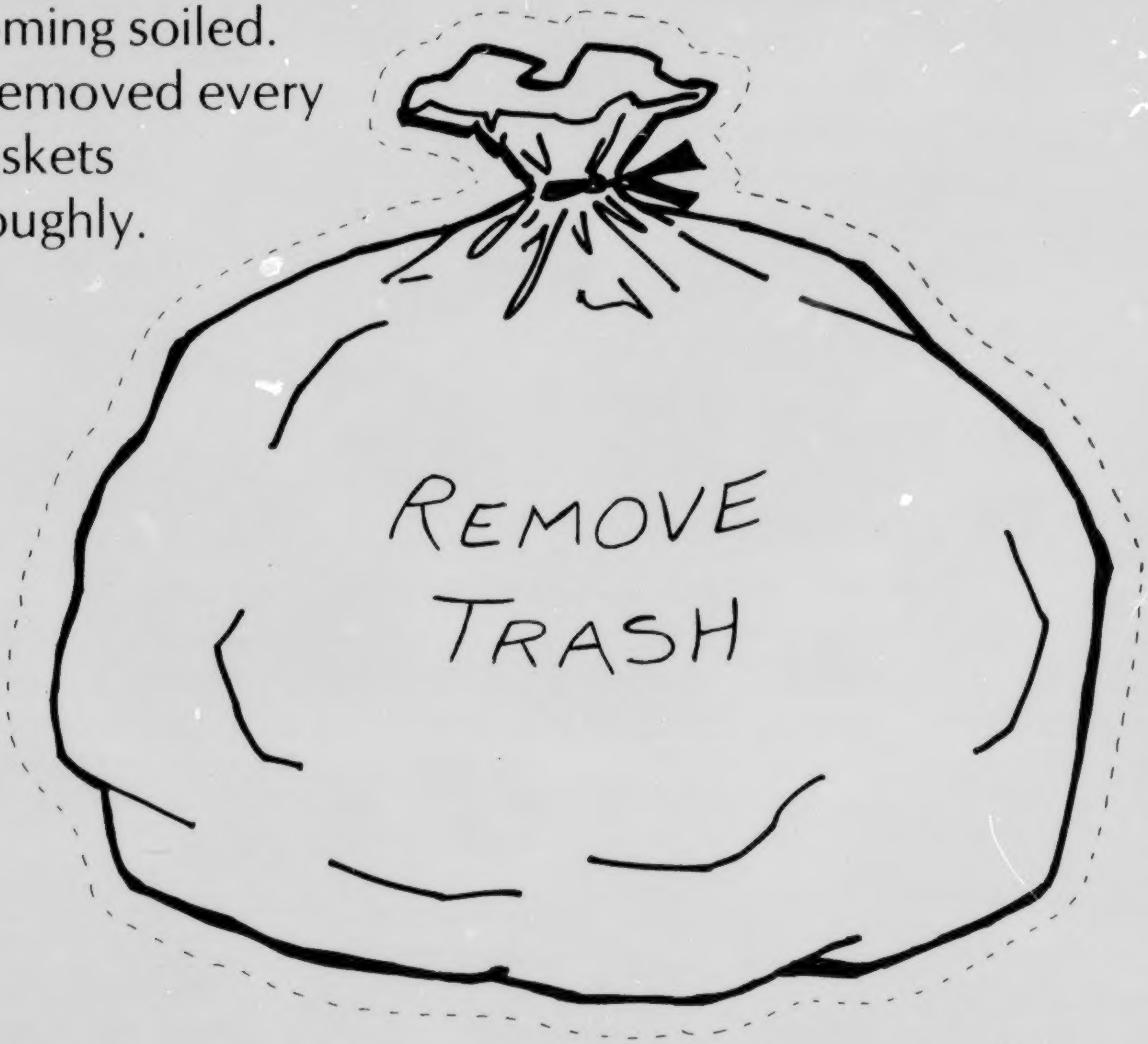


COCKROACH TRAPS are cardboard boxes lined with non-toxic glue. The glue is mildly scented to attract German cockroaches. Roaches enter the box and get stuck (and die) in the glue. The traps should be placed next to the walls and in cluttered places where roaches like to hide.



A **WRENCH** can be used to tighten nuts on a leaky faucet. It can also be used to remove the nuts so that old washers can be replaced. (First turn the handle under the sink to shut the water valve. Sometimes you have to follow the pipes to find the valve.)

A plastic **GARBAGE BAG** keeps the inside of the trash basket from becoming soiled. Trash should be removed every day and soiled baskets washed out thoroughly.



Filmstrip Program Script

"Cockroach Clean-Up Tour"

1 WELCOME TO: THE COCKROACH CLEAN-UP TOUR!

2 THERE ARE A LOT OF INSECTS IN THE WORLD.

3 SOME OF THEM LIVE OUTDOORS . . .

4 . . . AND SOME OF THEM LIVE INDOORS – WITH US.

5 SOME INSECTS ARE CONSIDERED "BENEFICIAL" OR "HELPFUL." CAN YOU NAME ANY OF THESE BUGS?

6 (NAMES)

7 OTHER INSECTS CAN BECOME "PESTS" IF THEY MAKE US ILL OR EAT TOO MUCH OF OUR FOOD. CAN YOU NAME ANY OF **THESE** INSECTS? WHICH ONES WOULD YOU CALL "PESTS"?

8 (NAMES)

9 TODAY WE ARE GOING TO LEARN ABOUT ONE OF THESE INSECT PESTS. CAN ANY OF YOU NAME THIS INSECT? (COCKROACH)

10 COCKROACHES HAVE BEEN AROUND FOR OVER 350 MILLION YEARS. THEY'VE PROBABLY BEEN LIVING IN OUR HOMES SINCE WE WERE LIVING IN CAVES.

11 THEY ARE PESTS BECAUSE THEY EAT OUR GARBAGE AND THEN SPREAD THE GERMS INTO OUR FOOD. THIS CAN MAKE US ILL.

12 FIGHTING INSECTS CAN BE A REAL BATTLE. WE USE POISONS TO TRY TO KILL THEM BUT THEN WE MAY POISON **OURSELVES** AS WELL – AND THE INSECTS USUALLY JUST COME BACK AGAIN ANYWAY.

13 A BETTER WAY TO CONTROL INSECTS IS TO TAKE AWAY THE THINGS THAT MAKE THEM WANT TO LIVE IN OUR HOMES. JUST LIKE YOU AND ME, COCKROACHES NEED FOOD, WATER, AND A SUITABLE PLACE TO LIVE.

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14 LET'S TAKE A LITTLE WALK THROUGH THIS KITCHEN AND SEE WHY COCKROACHES ENJOY LIVING HERE. FIRST OF ALL, WHERE DO YOU SUPPOSE COCKROACHES COULD FIND **FOOD** IN THIS KITCHEN – AND WHAT CAN WE DO ABOUT IT?

15 WE CAN KEEP FOOD FROM THE ROACHES IF WE SEPARATE FOOD (OR "ORGANIC") GARBAGE FROM THE REST OF OUR TRASH . . .

16 . . . AND **PUT A LID ON IT!** (A TIGHTLY FITTING LID, SO THAT THE ROACHES CAN'T GET INTO IT.)

17 WE CAN CUT DOWN ON THE AMOUNT OF TRASH WE HAVE TO STORE BY RECYCLING PAPER, GLASS AND ALUMINUM.

18 COCKROACHES CAN GET INTO CARDBOARD BOXES OF FOOD . . .

19 . . . BUT THEY **CAN'T** IF WE STORE OUR FOOD IN TIGHTLY-SEALED CONTAINERS.

20 A LITTLE BIT OF FOOD LEFT ON A DIRTY PLATE CAN KEEP A WHOLE ARMY OF ROACHES FAT AND HAPPY;

21 BUT IF WE WASH OUR DISHES RIGHT AWAY (OR LET THEM SOAK IN SOAPY WATER IF WE REALLY DON'T HAVE TIME), THE ROACHES WILL HAVE TO GO SOMEWHERE ELSE FOR THEIR DINNER! BYE BYE ROACHES!

22 WE CAN REMOVE PET FOOD AFTER EACH FEEDING SO THAT WE DON'T FEED OUR **ROACHES** AS WELL AS OUR PETS!

23 COCKROACHES CAN GET BY ON VERY LITTLE FOOD, BUT THEY **MUST** HAVE PLACES TO LIVE. THEY LIKE TO LIVE IN LITTLE CRACKS: IN CUPBOARDS, AROUND THE SINK, NEAR THE FLOOR – THEY HIDE IN THE CRACKS DURING THE DAY AND COME OUT AT NIGHT TO EAT.

24 DO YOU SEE ANY PLACES HERE THAT A ROACH MIGHT WANT TO CALL "HOME SWEET HOME"? HOW COULD WE GET RID OF THESE COCKROACH HOUSING PROJECTS?

25 CAULK IS AN INEXPENSIVE CRACK-FILLER THAT LOOKS LIKE VERY THICK PAINT. WE CAN SQUIRT IT INTO THE CRACKS WITH A "CAULK GUN" AND IT GETS HARD AS IT DRIES. IT'S EASY TO USE AND IT GIVES THE ROACHES FEWER PLACES TO LIVE AND HIDE IN.

26 GROWN-UPS CAN BUY COCKROACH TRAPS AT STORES. COCKROACH TRAPS (OR "ROACH MOTELS") ARE LITTLE CARDBOARD BOXES THAT ARE COATED INSIDE WITH VERY STICKY GLUE.

27 IF YOU PUT THEM NEXT TO THE WALL NEAR THE STOVE OR SINK, ROACHES WILL WALK IN AND GET STUCK.

28 ROACH TRAPS CAN HELP YOU GET RID OF THE ROACHES THAT ARE LEFT AFTER YOU'VE REMOVED THEIR FOOD AND HOMES. YOU CAN OPEN UP THE TRAPS AND COUNT THE NUMBER OF ROACHES INSIDE. (LOTS OF ROACHES IN A TRAP MEANS THAT YOU STILL HAVE WORK TO DO!)

29 NOT ALL INSECTS ARE BAD. BUT WE **CAN** KEEP THE UNHEALTHY ONES (LIKE THE COCKROACHES) OUT OF OUR HOMES BY TAKING AWAY . . .

30 . . . THEIR FOOD AND WATER . . .

31 . . . AND THE CRACKS IN WHICH THEY LIVE.

32 WE CAN KEEP OUR HOMES CLEAN AND FREE OF PESTS SIMPLY BY HAVING A COCKROACH CLEAN-UP TOUR IN OUR VERY OWN HOME!

33 (PICTURE OF CLEAN KITCHEN)

34 PRODUCED BY THE CENTER FOR THE INTEGRATION OF APPLIED SCIENCES, A DIVISION OF THE JOHN MUIR INSTITUTE

MY VERY OWN

Cockroach Clean-Up Tour

by Kathleen Letcher Cowles
Illustrated by Jean Pajot Smith

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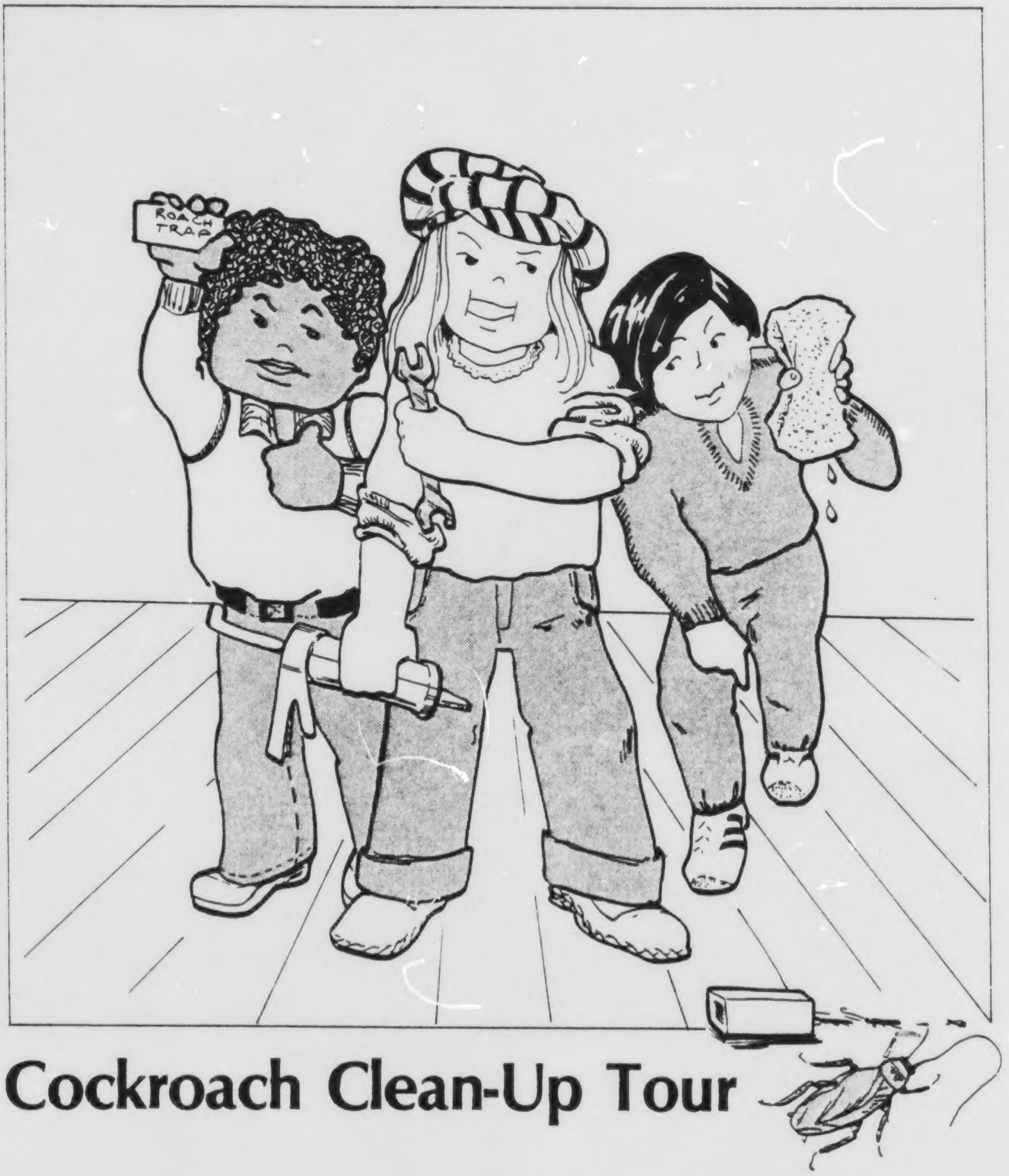
MY VERY OWN



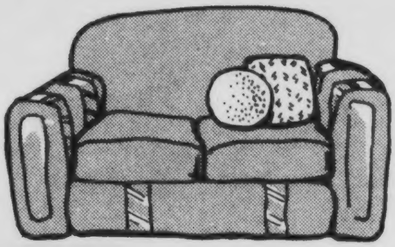
Cockroach Clean-Up Tour

Unfortunately, it's easy to get cockroaches.

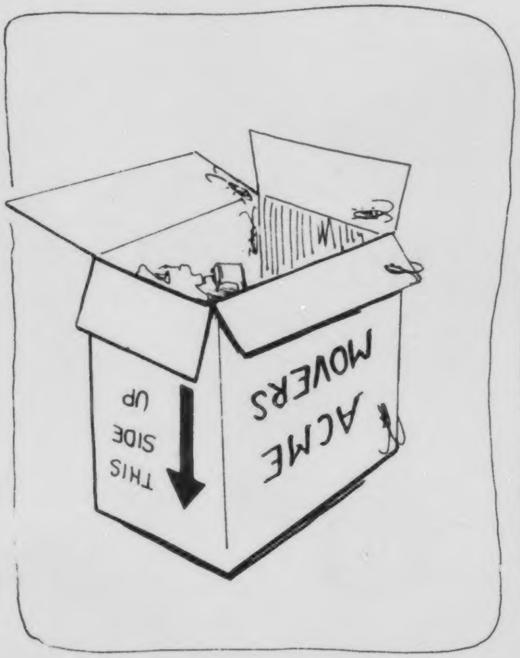
They might come home with us in our

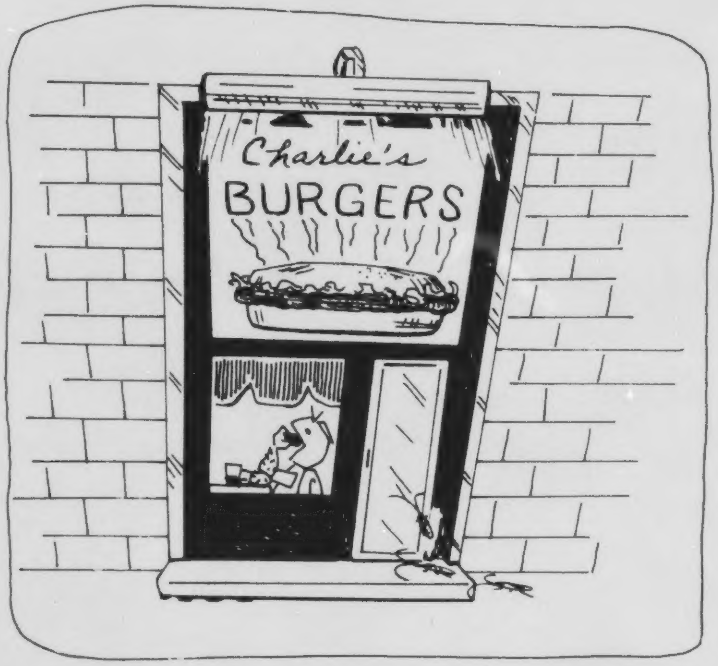
grocery bags, in our lunch boxes

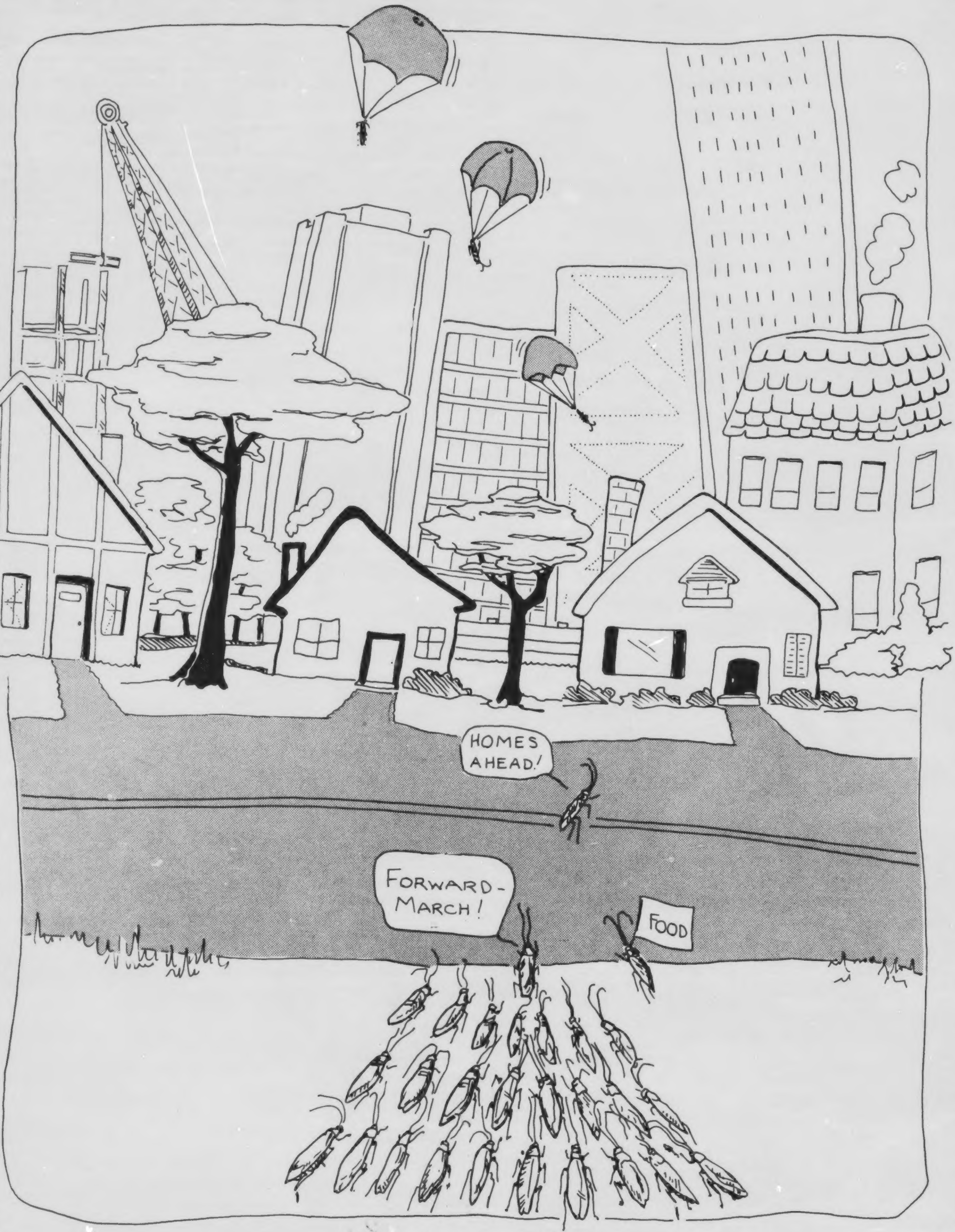
EAT
A
GOOD
LUNCH

in our furniture,  in our gym

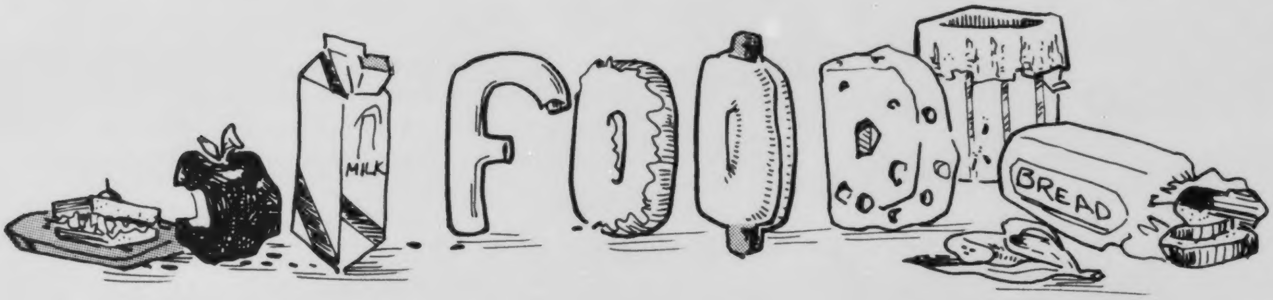
clothes, and in any other way you can think of . . .

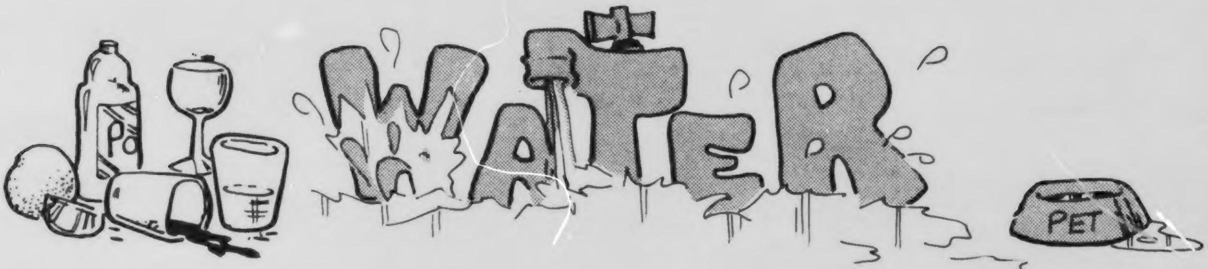

ACME MOVERS
THIS SIDE UP


Charlie's
BURGERS


HOMES AHEAD!
FORWARD-MARCH!
FOOD

But they stay with us
when we give them . . .


MILK
FOOD
BREAD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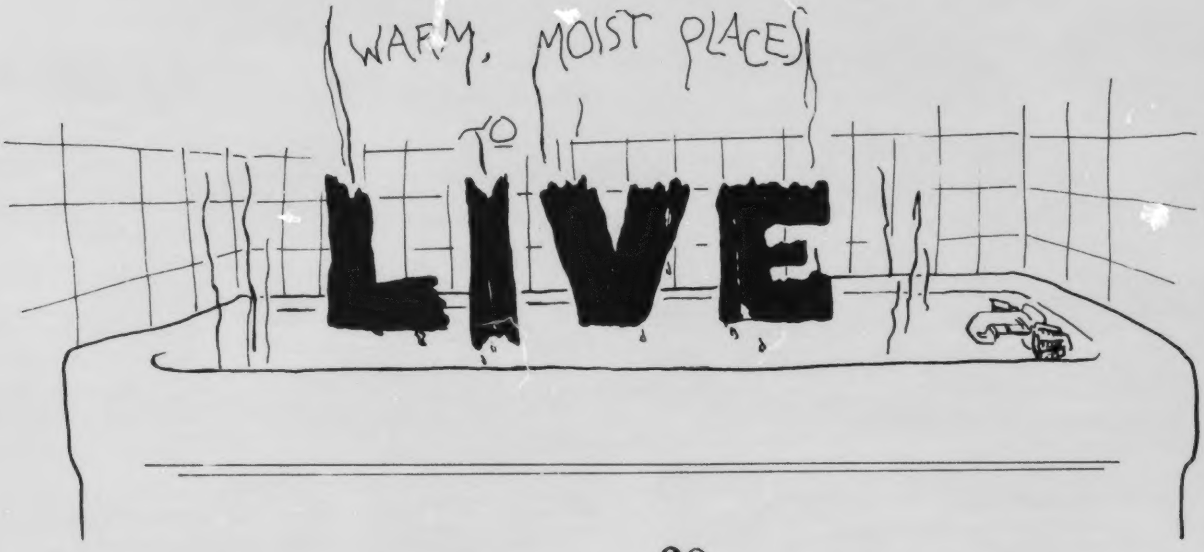
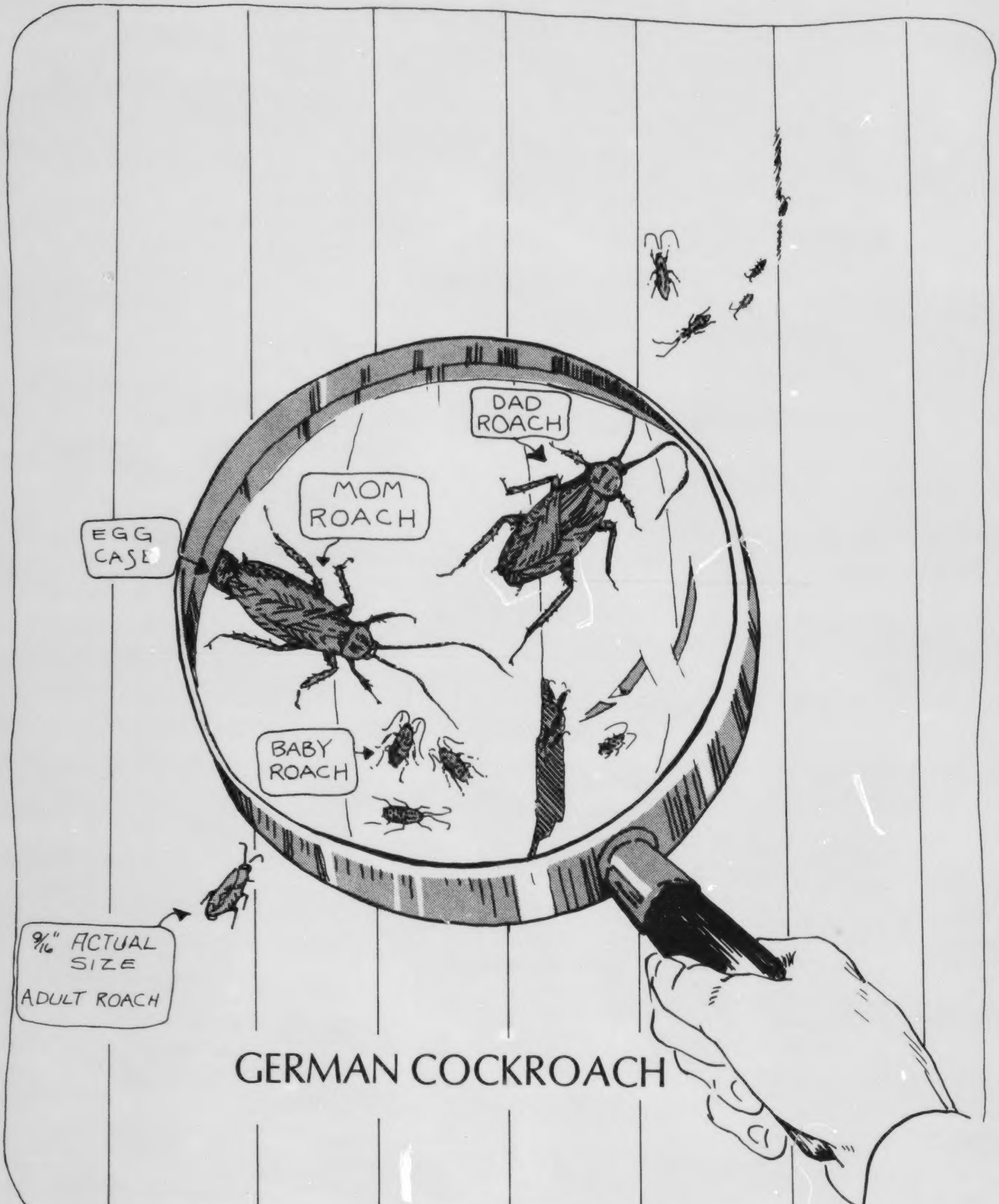
WATER
PET


WARM, MOIST PLACES
TO
LIVE


DAD ROACH
MOM ROACH
EGG CASE
BABY ROACH
9/16" ACTUAL SIZE
ADULT ROACH

GERMAN COCKROACH

In this kitchen, where could roaches find

Food? ______________________________

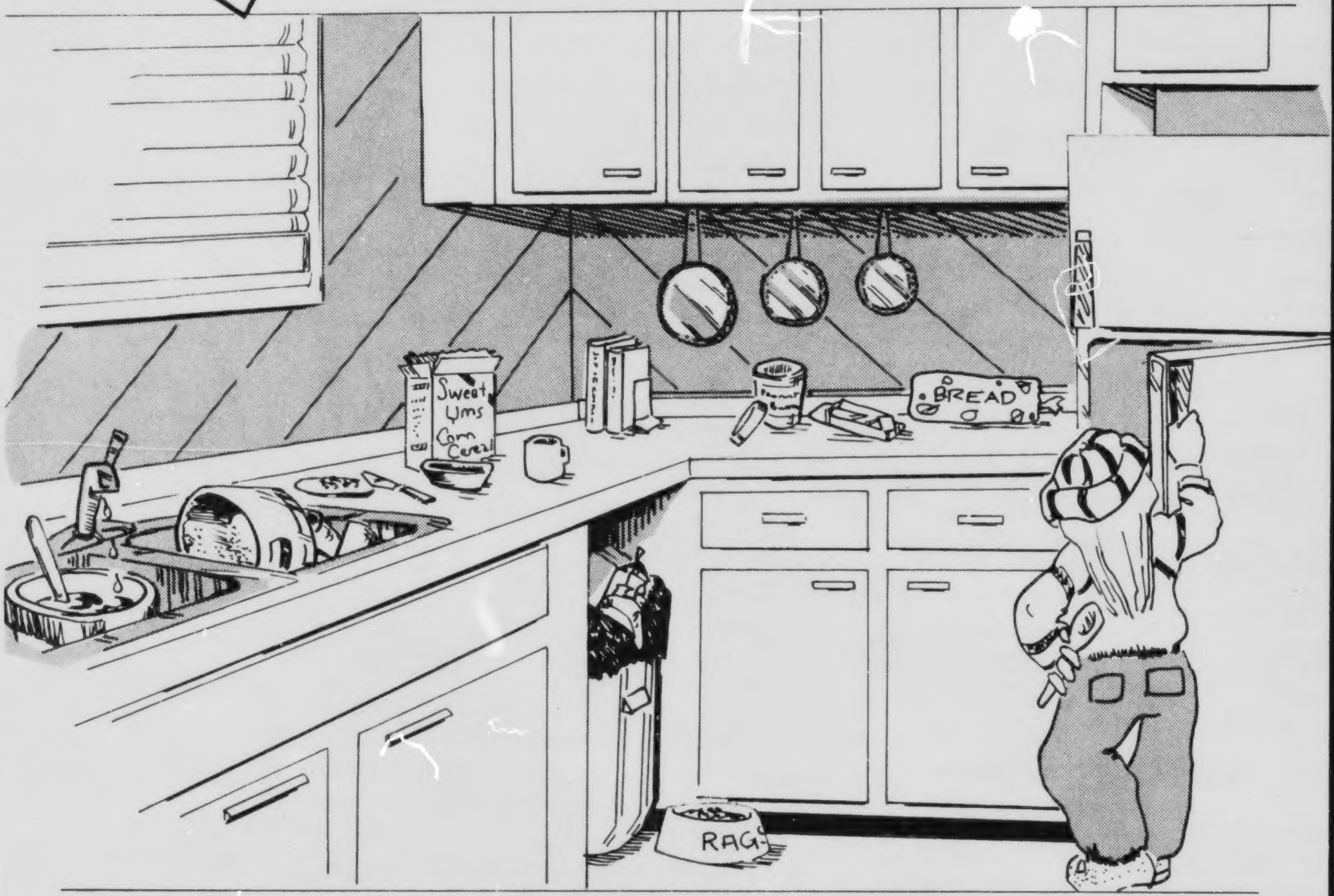
____

Water? ______________________________

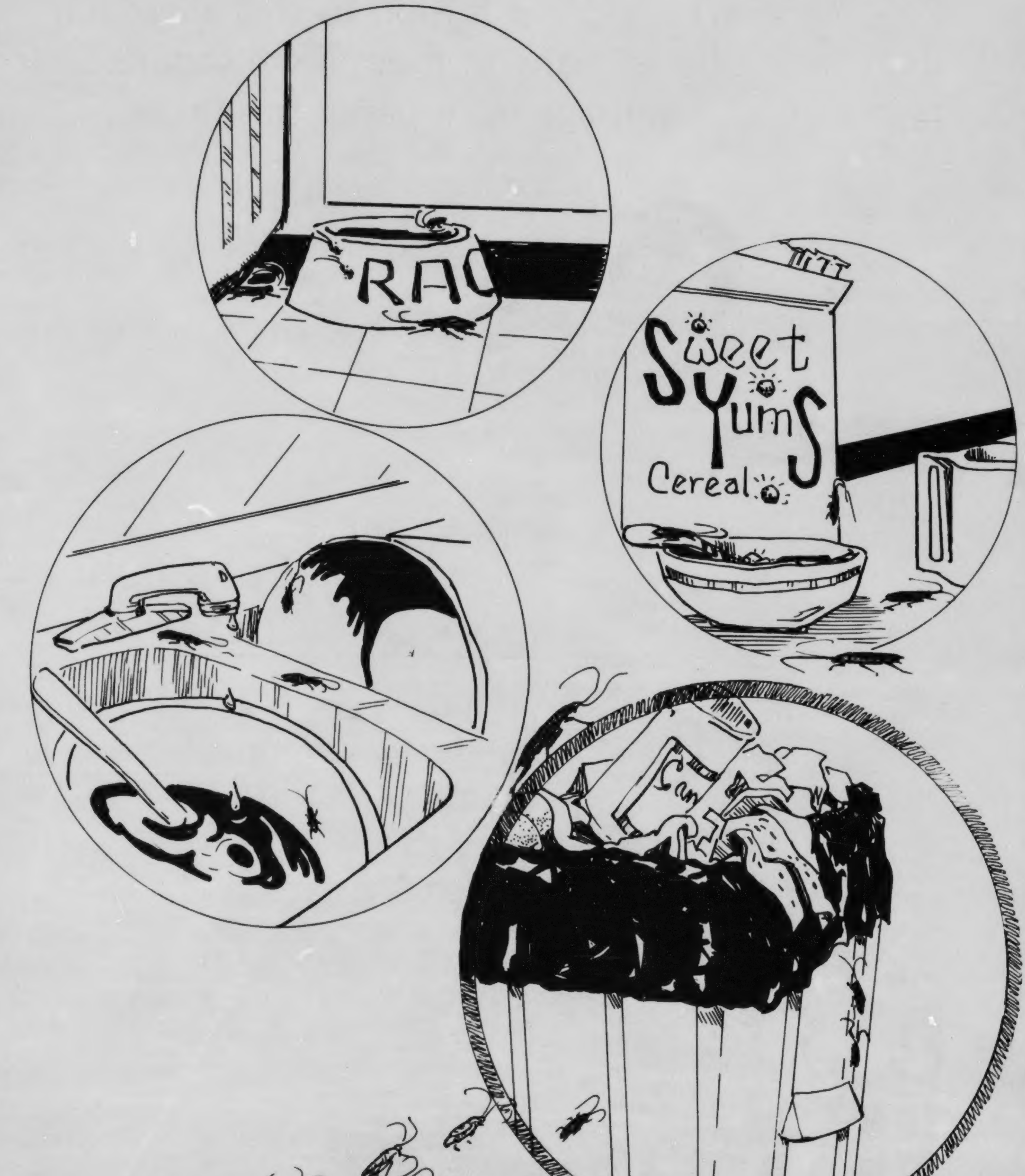
____

Places to hide? ______________________________

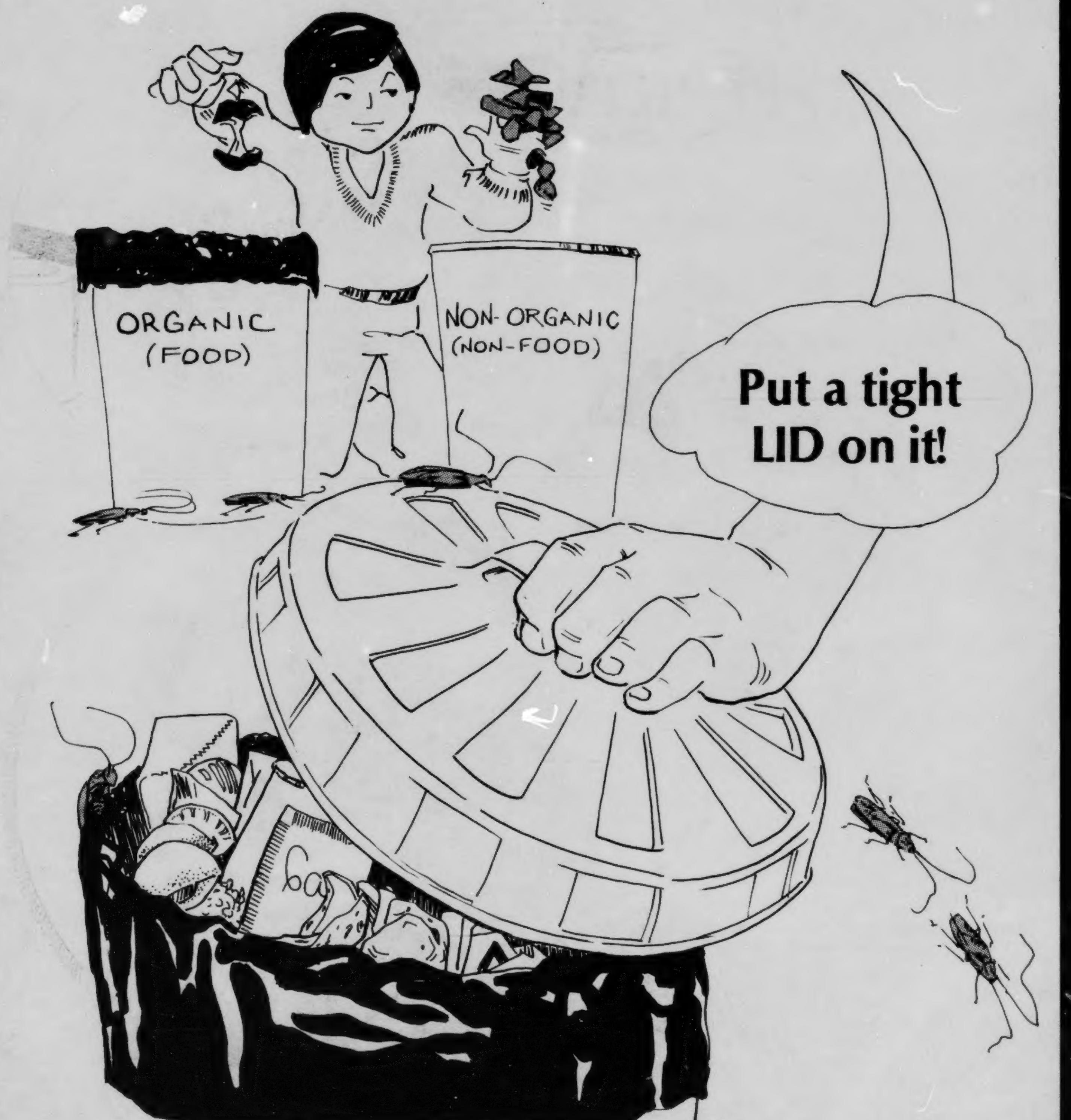
____


Sweet Yms Corn Cereal
BREAD
RAG

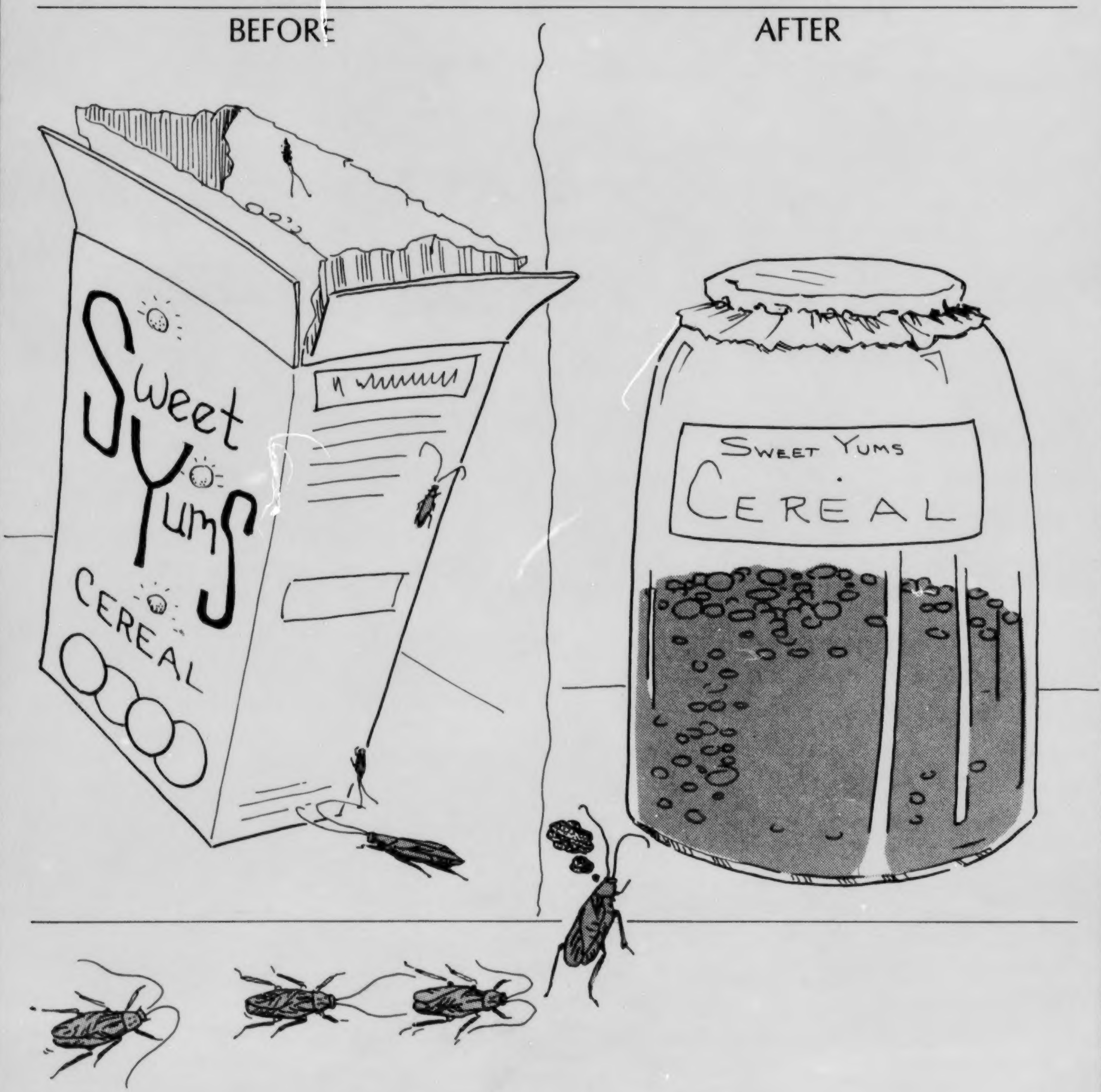
Let's take a walk with the cockroaches and find their favorite places!


RAC
Sweet Yums
Cereal
Can

Roaches don't need much food to stay alive, but there won't be as many of them if we separate organic (food) garbage from paper trash then...

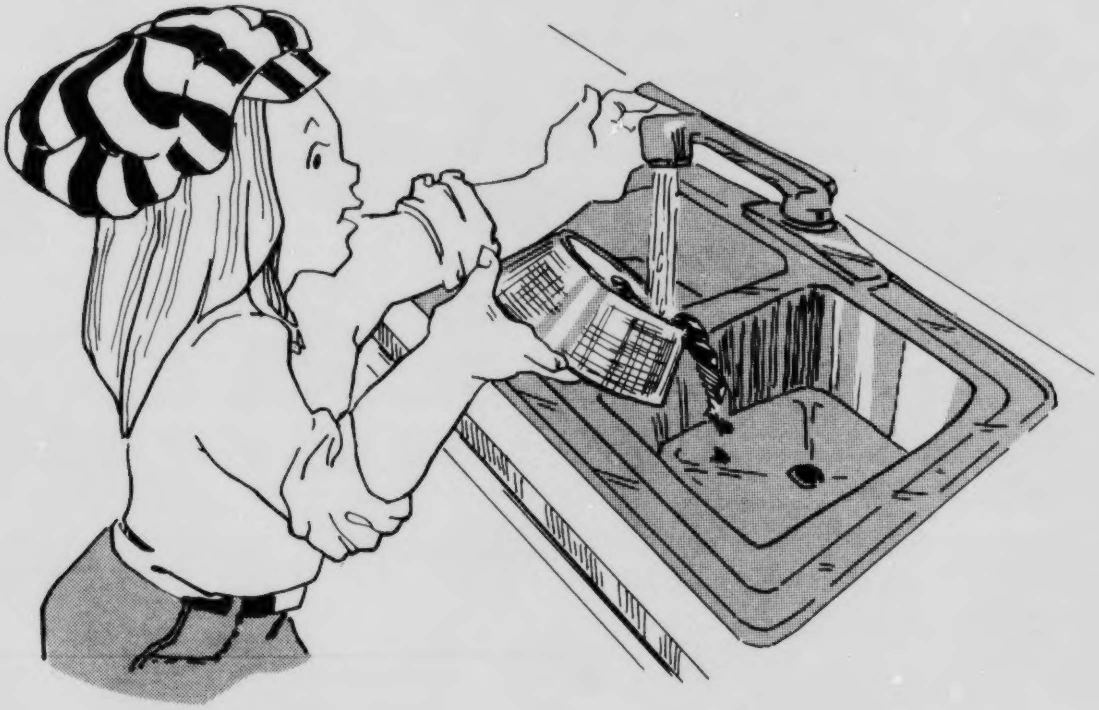

ORGANIC (FOOD)
NON-ORGANIC (NON-FOOD)
Put a tight LID on it!

Store food in tightly-sealed containers . . .

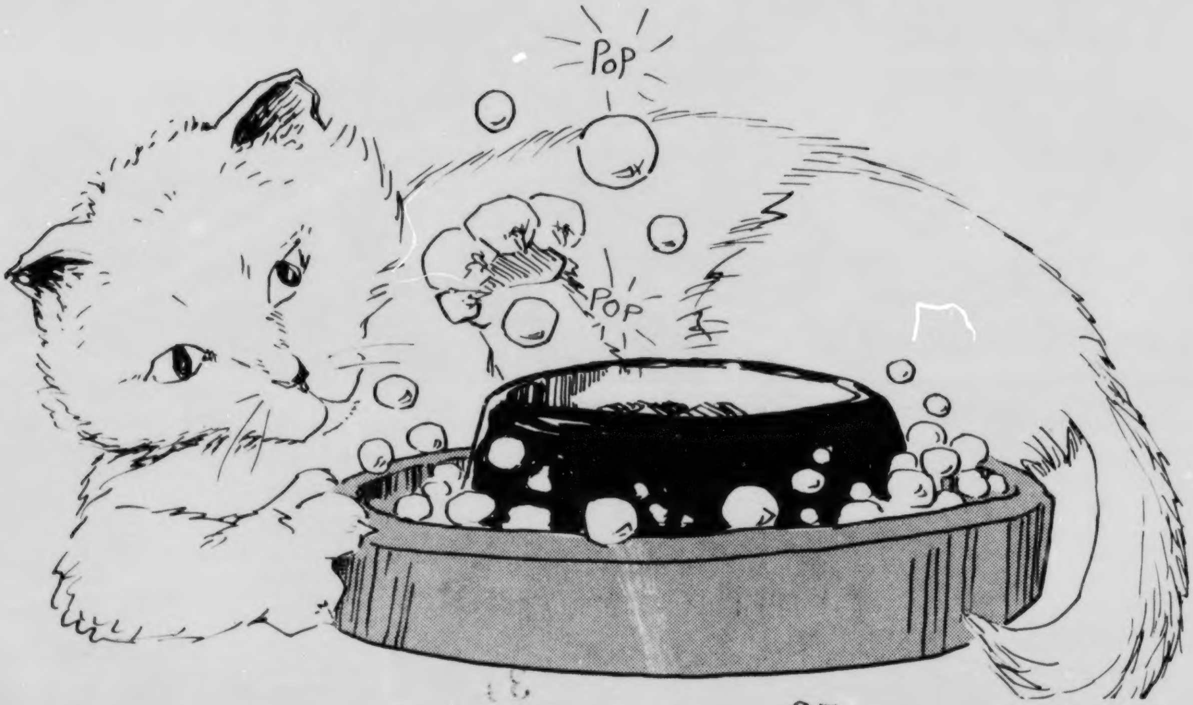

BEFORE
AFTER
Sweet Yums
CEREAL
SWEET YUMS
CEREAL

or in the refrigerator.

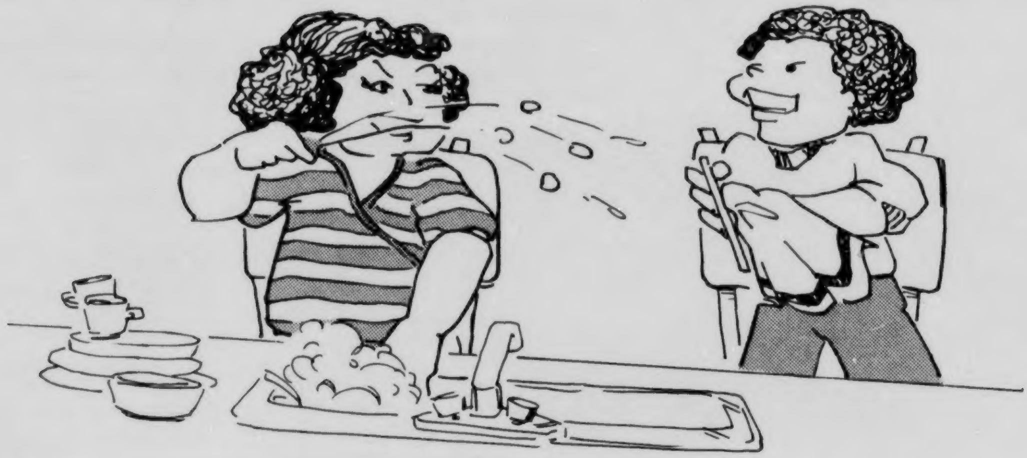
Remove pet food immediately after the pet has eaten or . . .



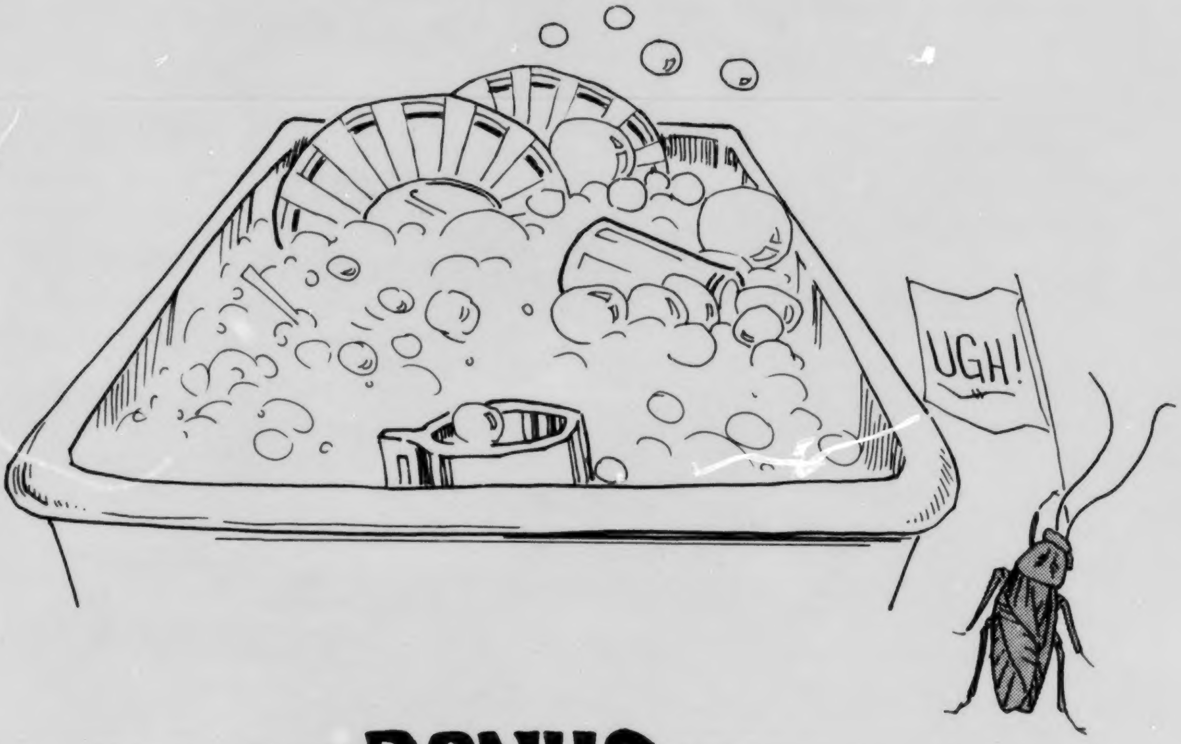
set the food dish in a pan of soapy water (so that roaches can't get to it.)



Wash dishes after use . . .

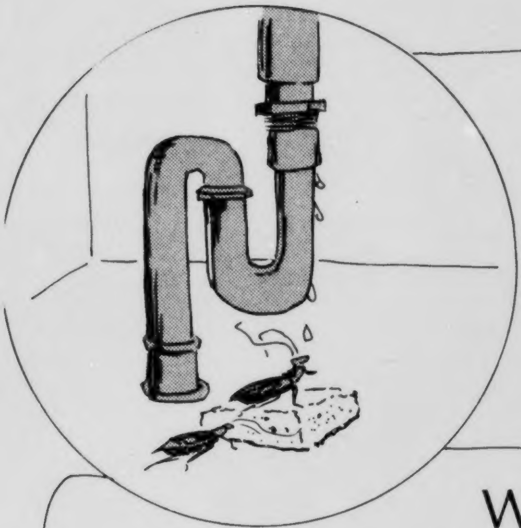


or let them soak in soapy water.

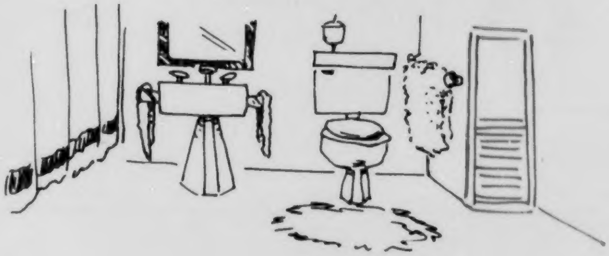


BONUS

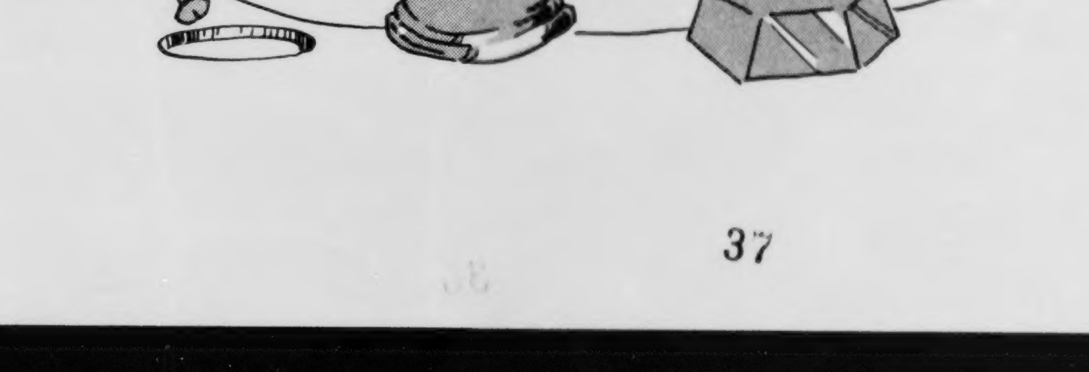
The ants and mice that were sharing your food with the roaches won't have anything to eat now either!



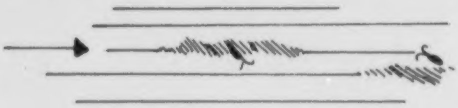
Roaches like to live in moist places.



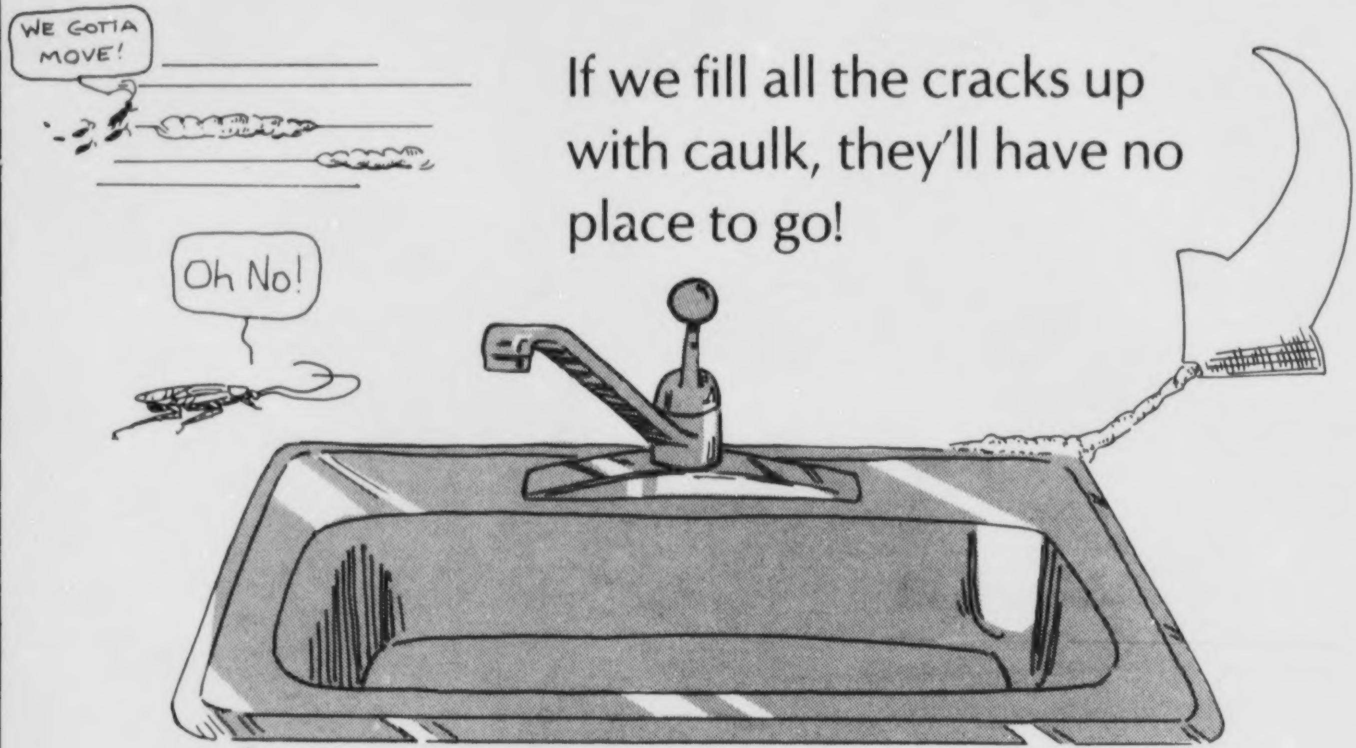
We can keep our kitchens and bathrooms dry by replacing worn-out washers or leaky faucets.



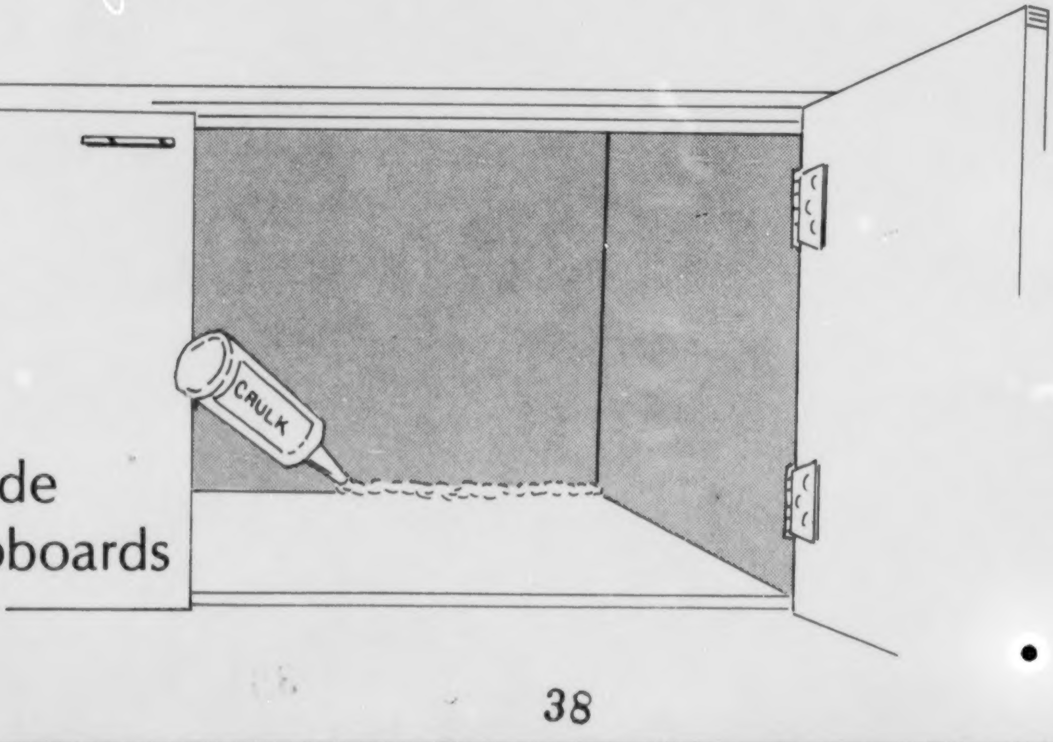
Roaches are happiest when they

have little cracks  to hide in.

If we fill all the cracks up with caulk, they'll have no place to go!

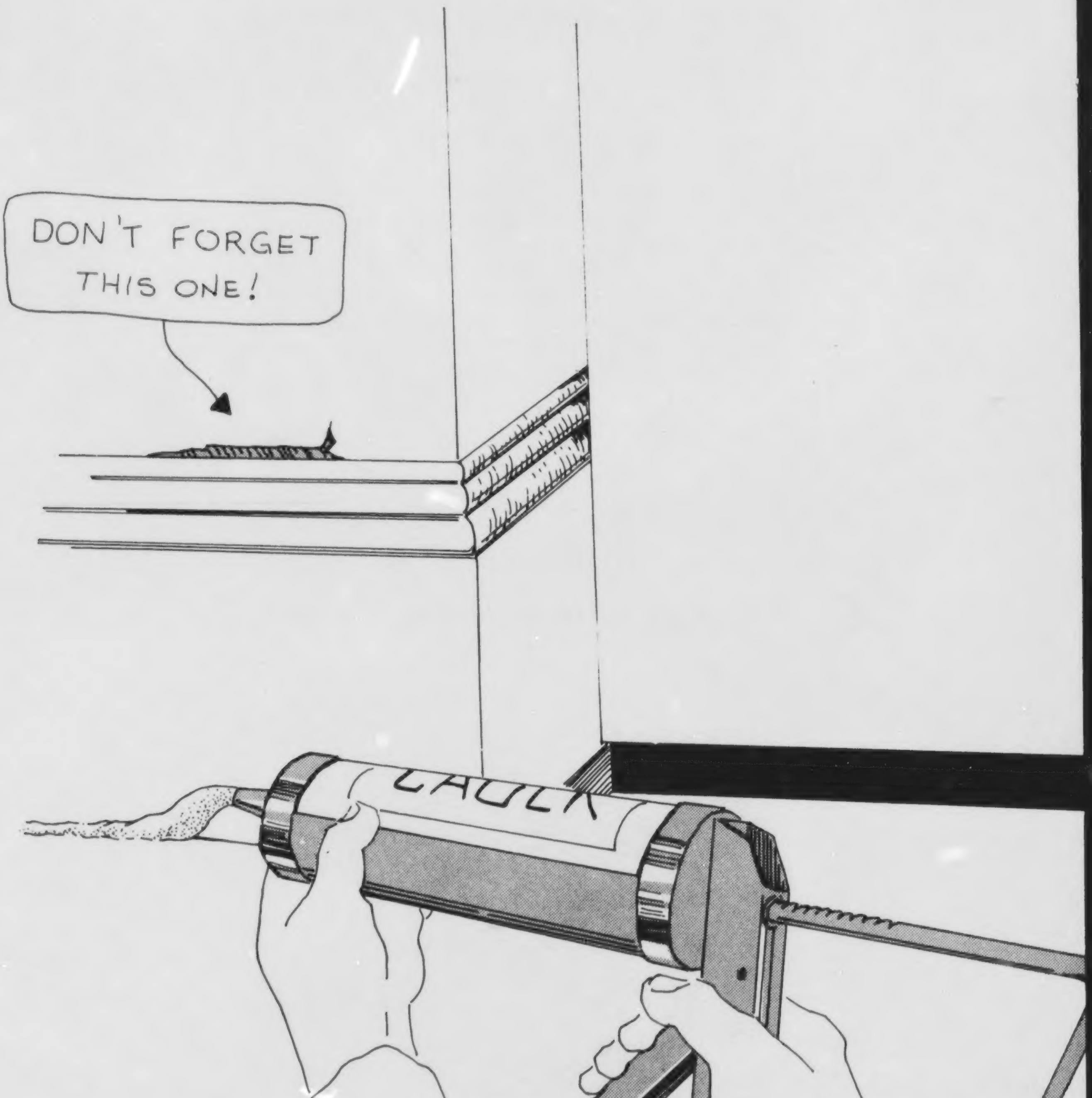

WE GOTTA MOVE!
Oh No!

☆ Around kitchen and bathroom sinks!



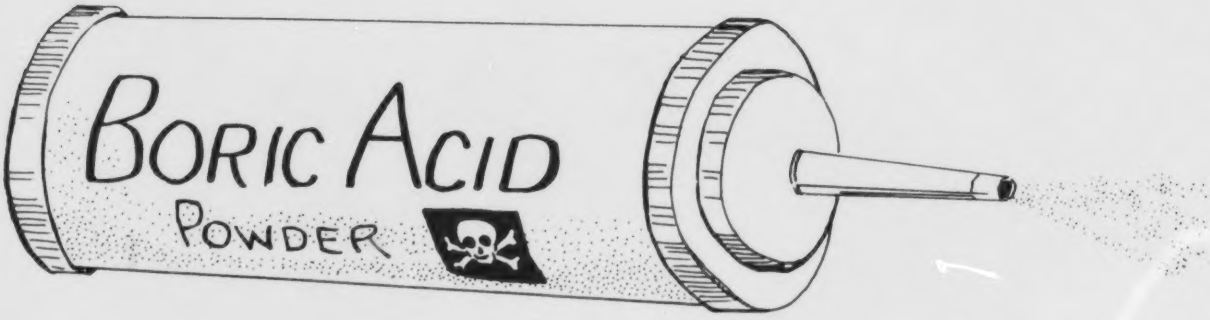
☆ Inside cupboards

Around baseboards and molding near the stove and refrigerator.


DON'T FORGET THIS ONE!
CAULK

What can we do with
the roaches once
we take away
their food, water
and homes?

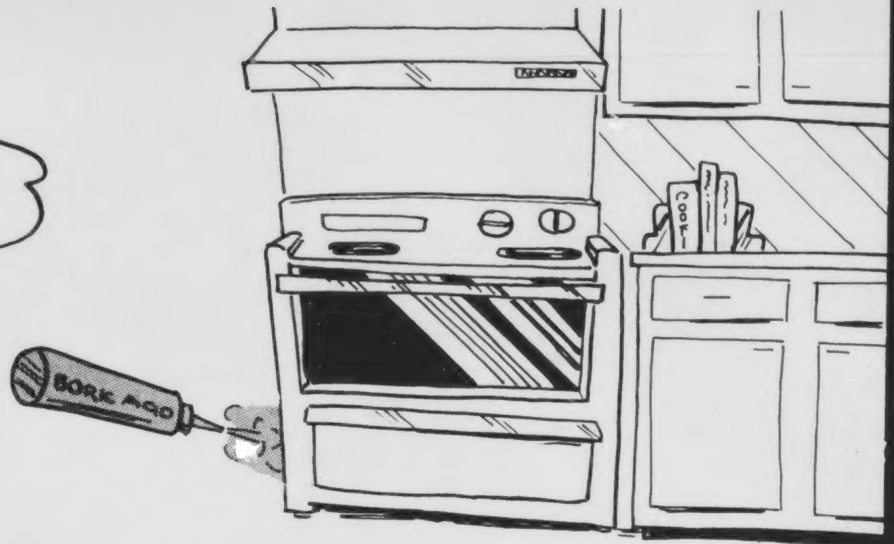
Grown-ups can buy

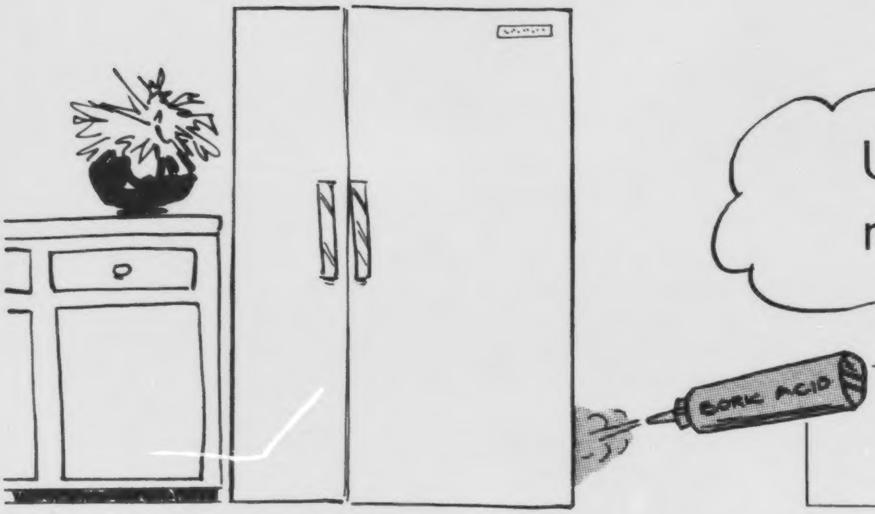

BORIC ACID
POWDER

at the hardware store

and apply it into out-of-the-way cracks.

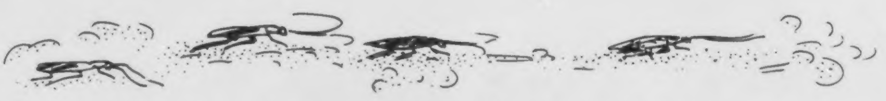
Behind the stove


BORIC ACID
COOK

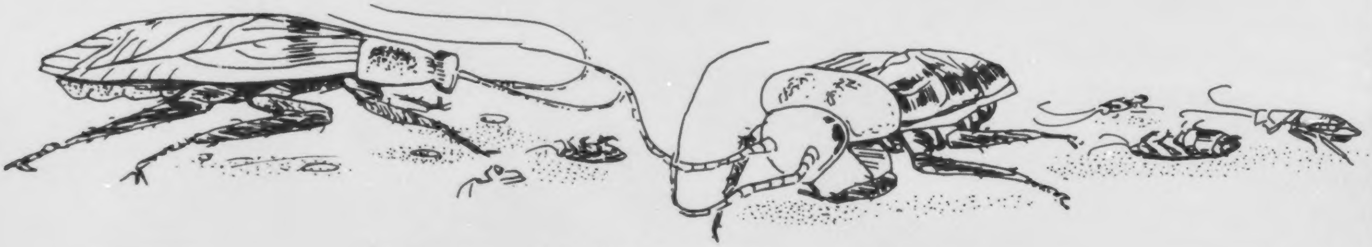


Under the refrigerator

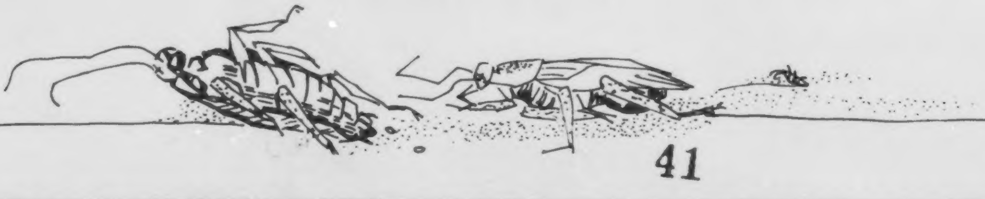
CAUTION: avoid breathing dust; follow label directions carefully.

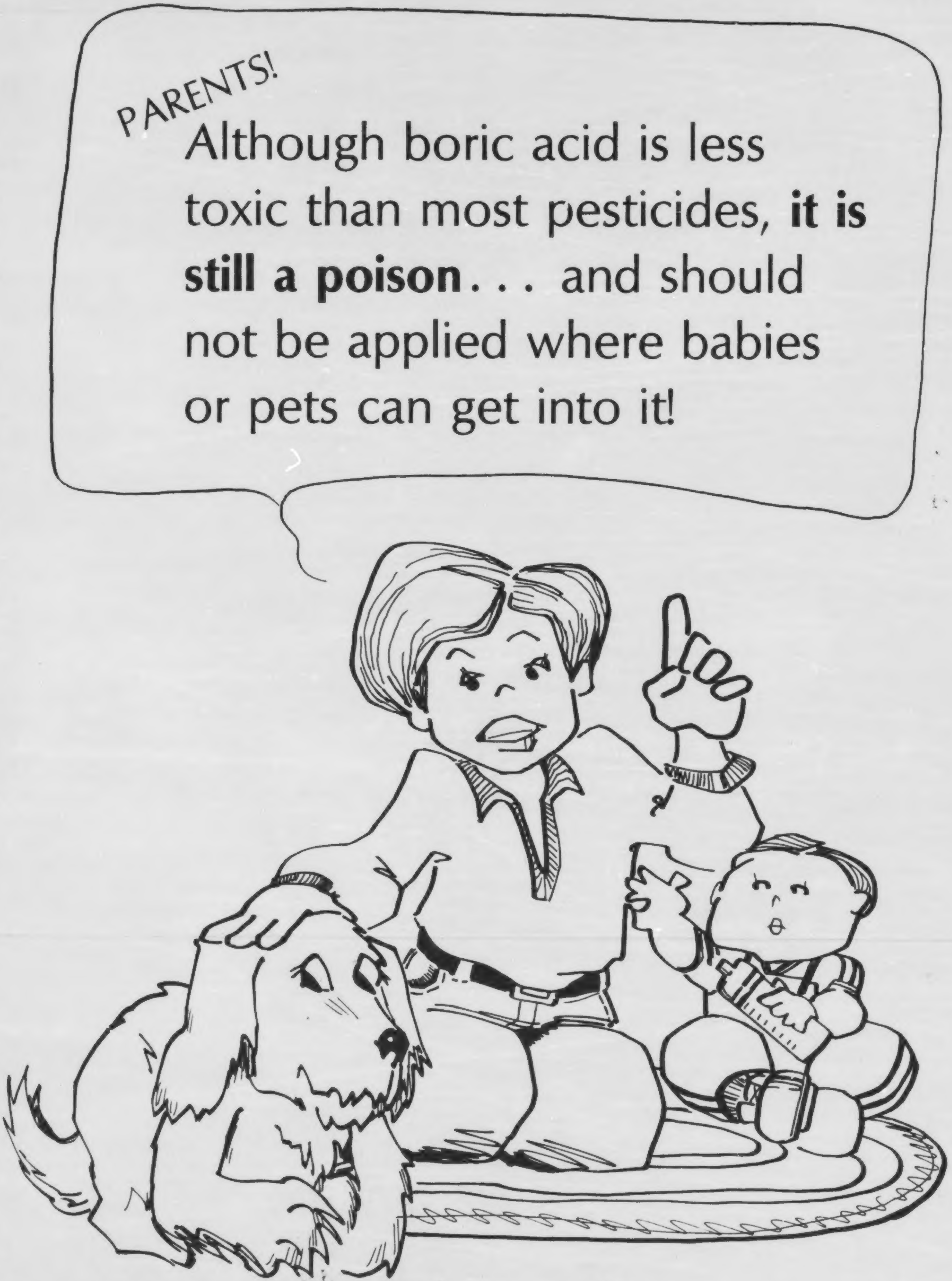


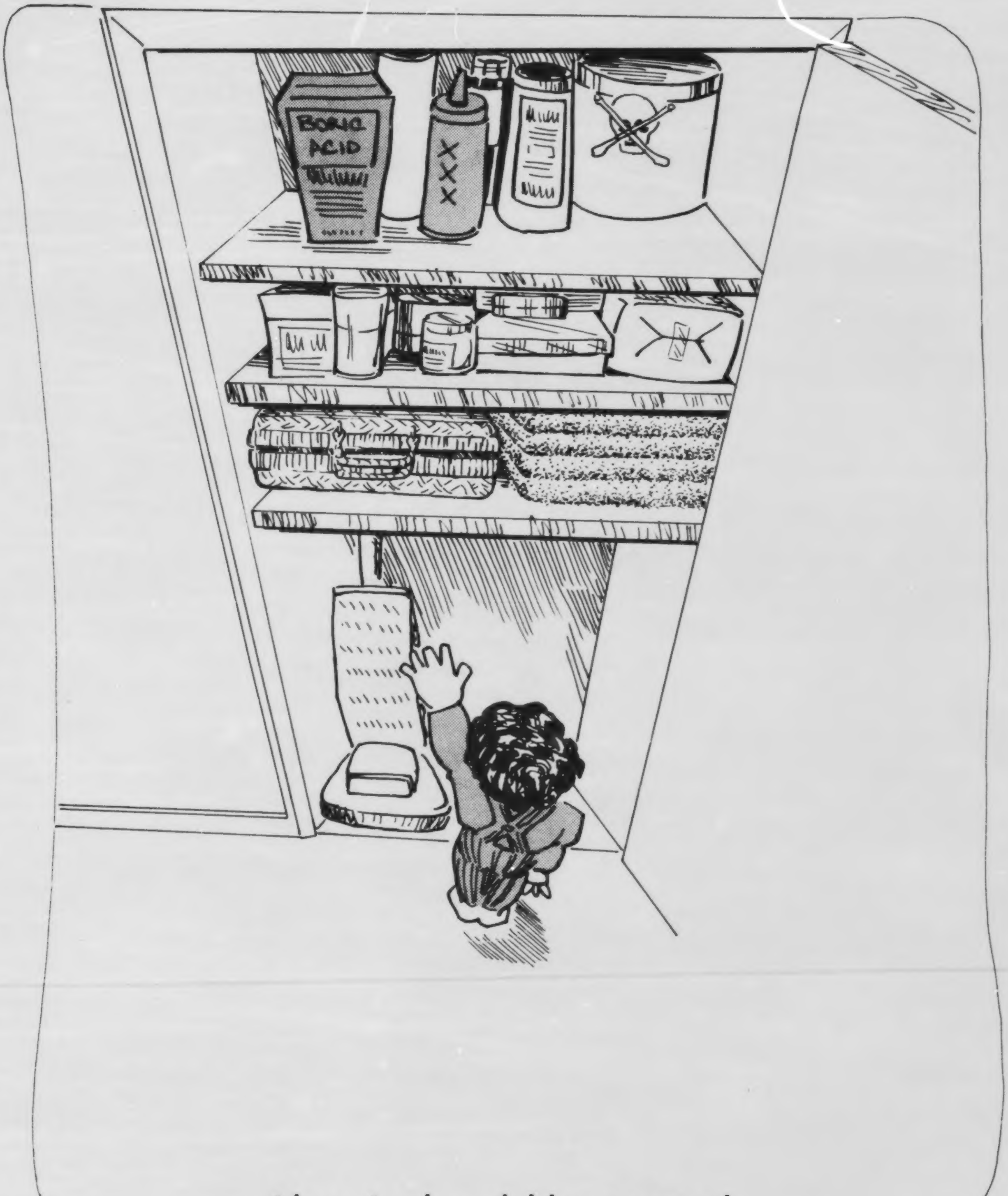
Roaches walk through it . . .



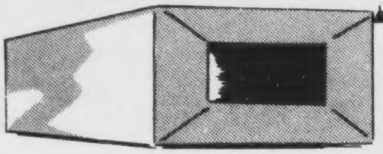
lick it off their feet and die.

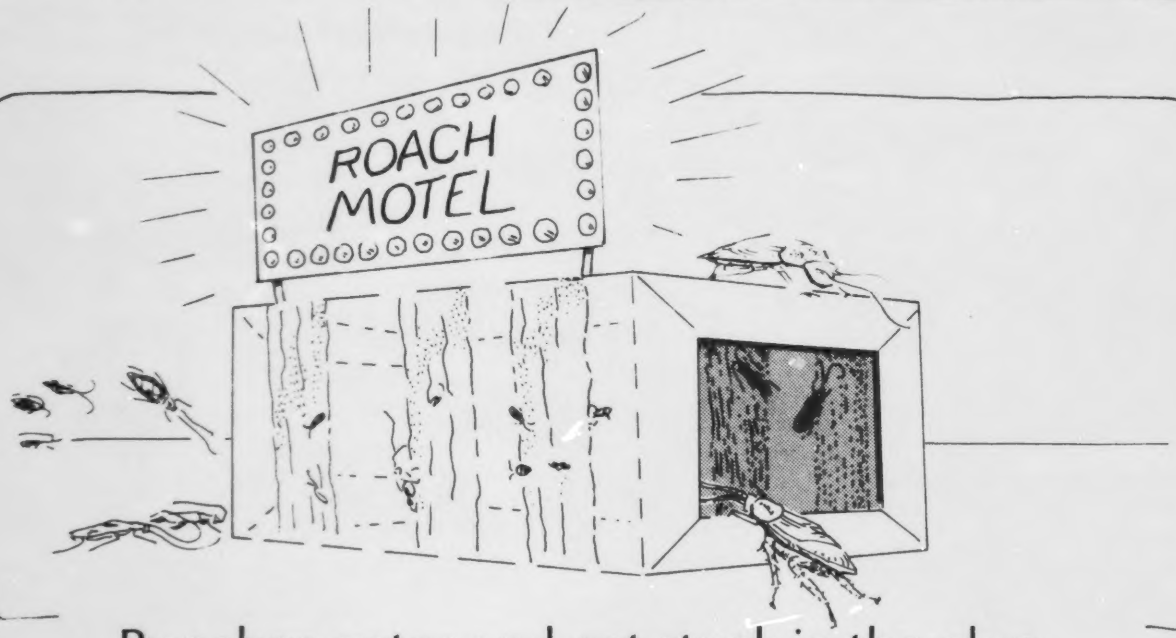



PARENTS!
Although boric acid is less toxic than most pesticides, **it is still a poison**. . . and should not be applied where babies or pets can get into it!

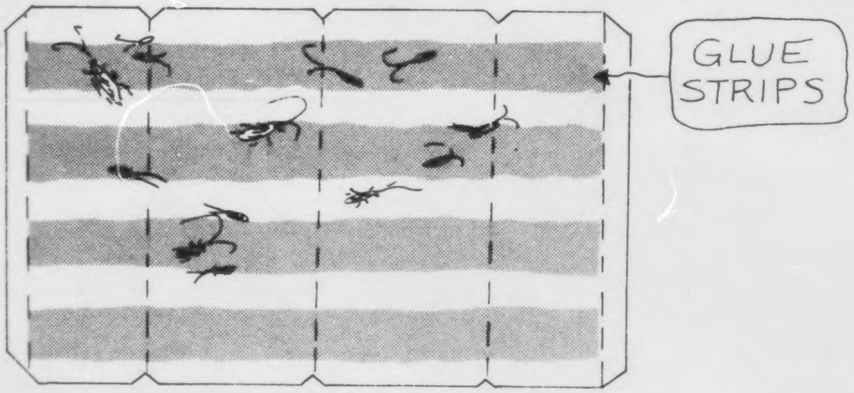

BORIC ACID
XXX

Also, it should be stored on a high shelf.

Cockroach  traps can also help you get rid of the roaches after you've removed their food and homes.


ROACH MOTEL

Roaches enter and get stuck in the glue.

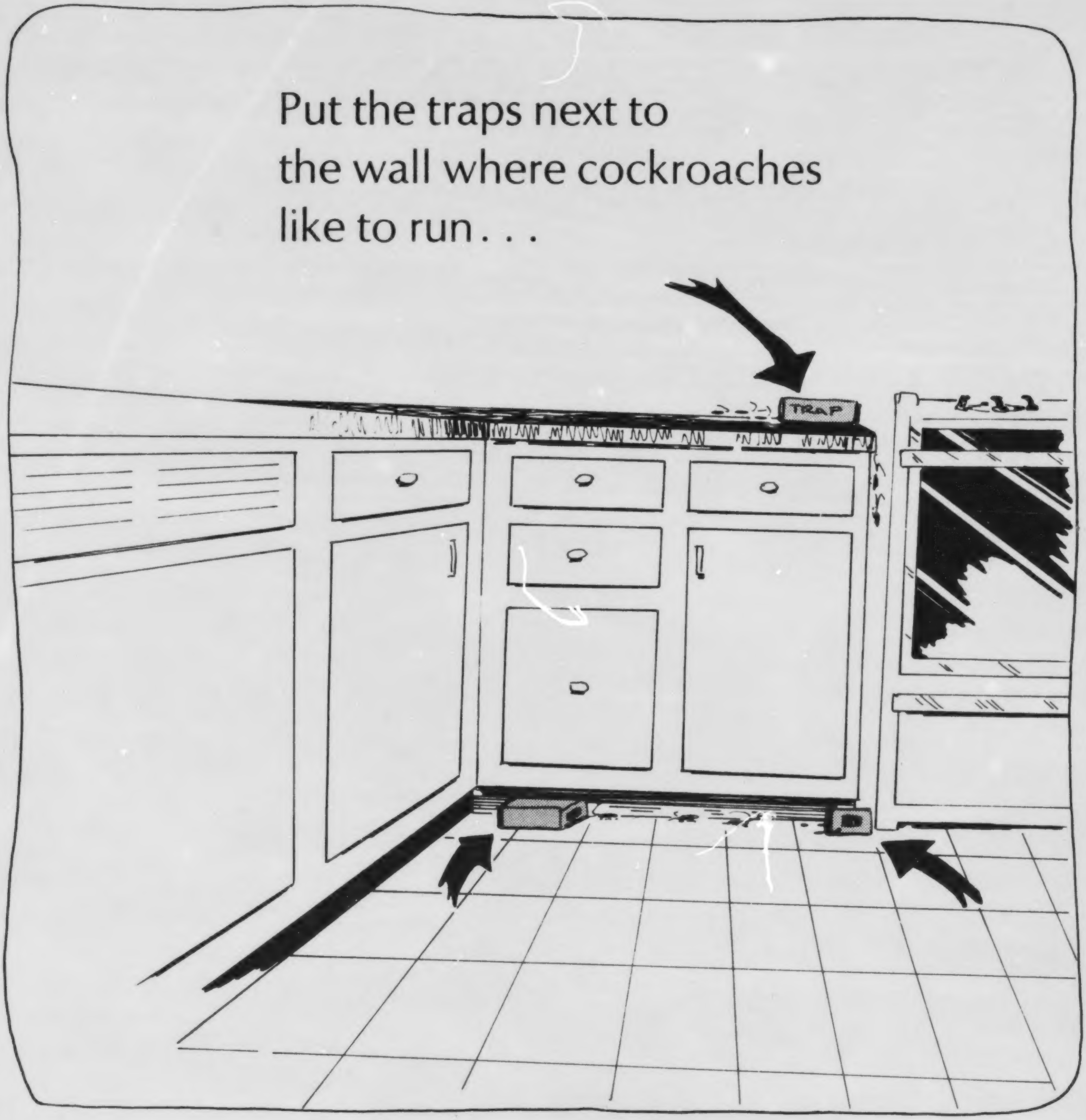

GLUE STRIPS

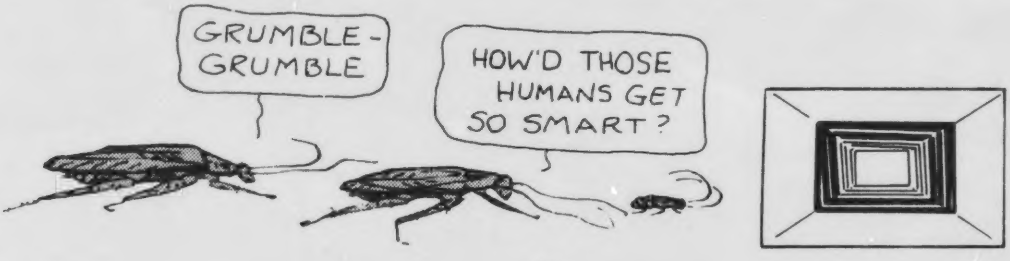
LATER

You can open the traps and count the roaches

* (A lot of roaches caught in one place means that you need to do more work there.)

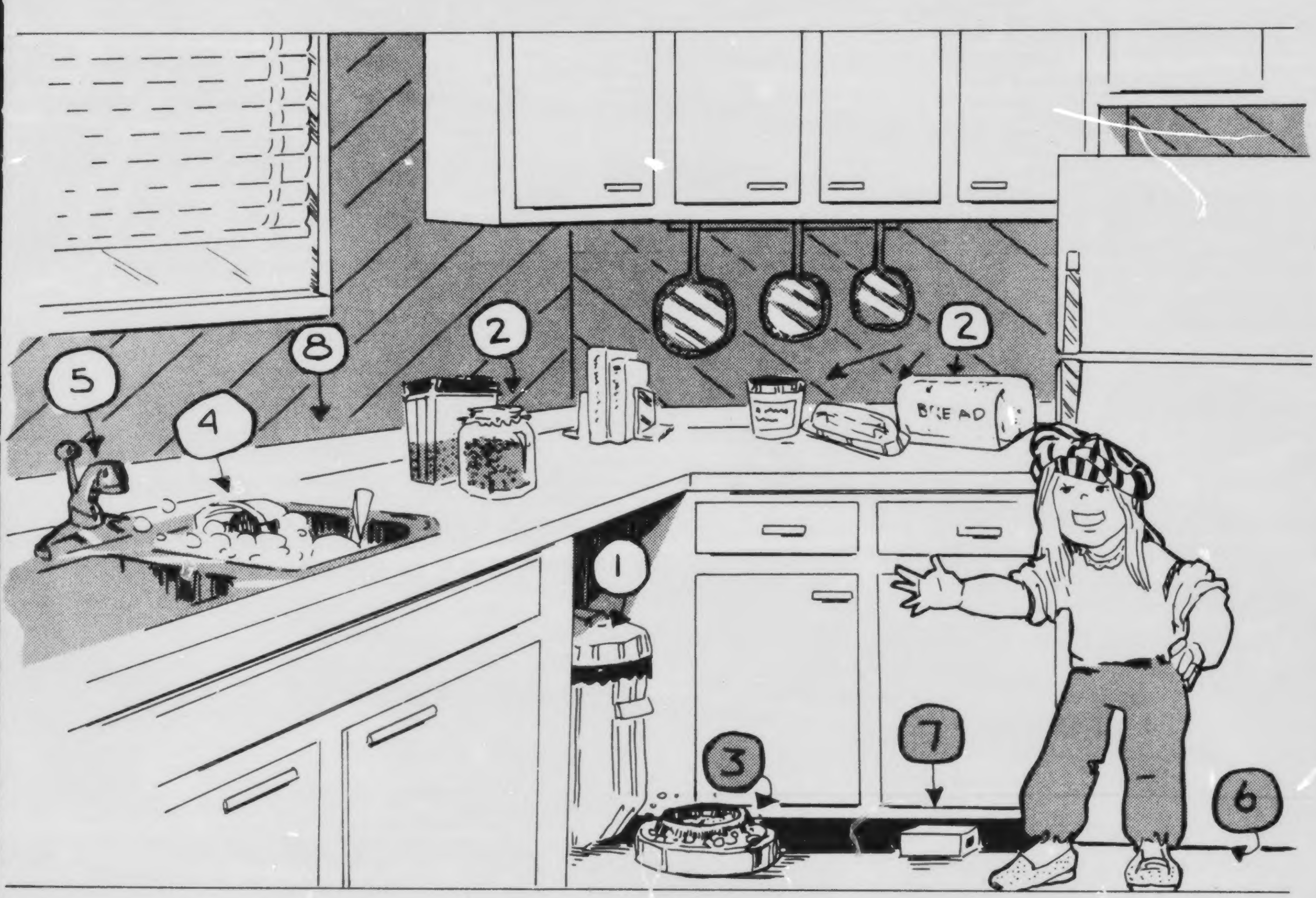
Put the traps next to
the wall where cockroaches
like to run . . .




GRUMBLE-
GRUMBLE
HOW'D THOSE
HUMANS GET
SO SMART?

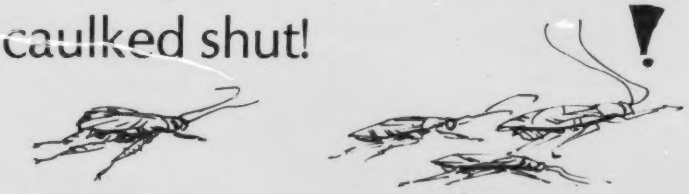
✓ Check these places in YOUR home:

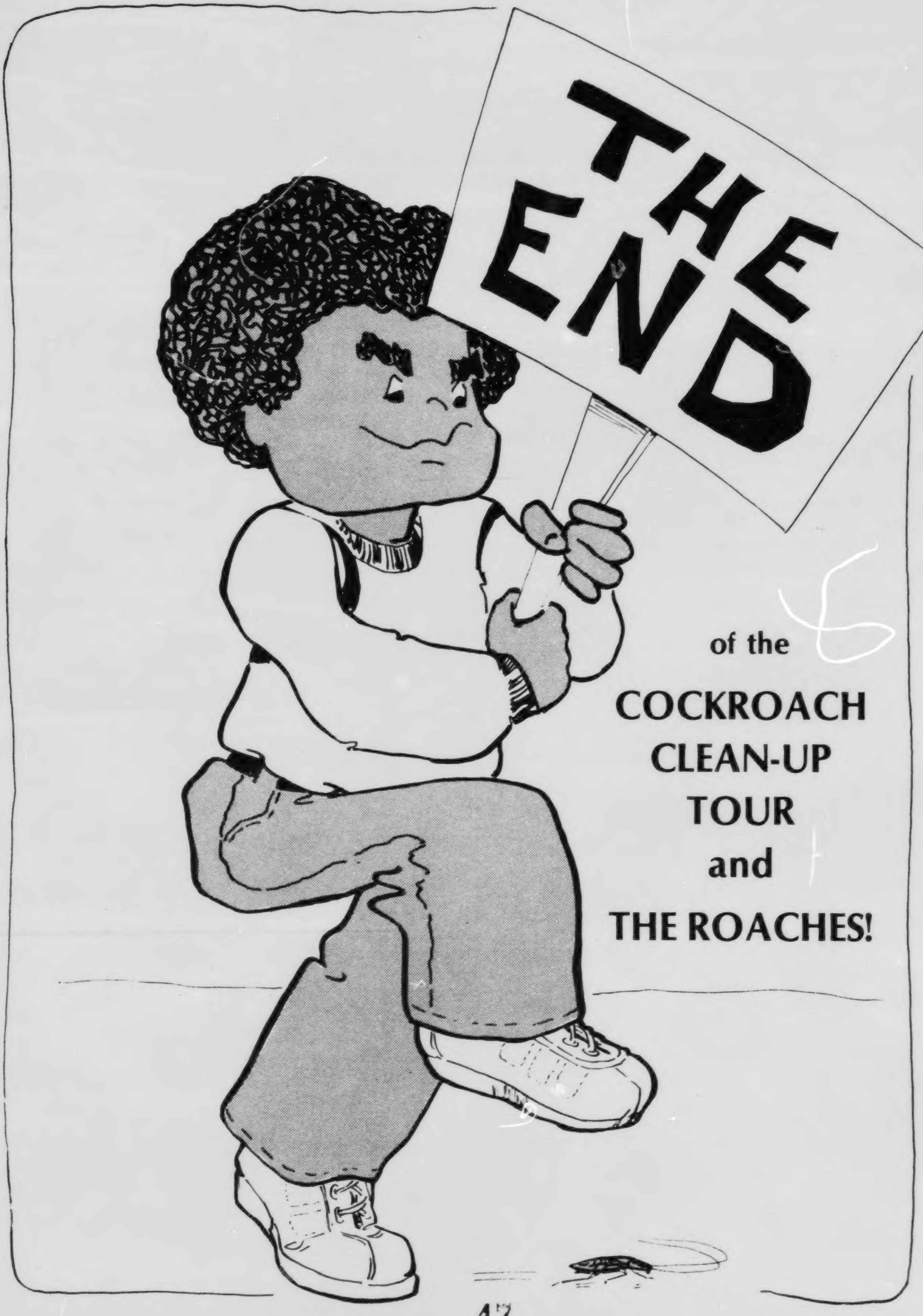
1___Lids on garbage
2___Food in sealed containers
3___Pet food in dish of soapy water
4___Dirty dishes washed or soaking in soapy water


5
8
4
2
2
BREAD
1
3
7
6

5___Leaky faucets repaired
6___Boric Acid used where needed
7___Cockroach traps used where needed
8___Cracks caulked shut!

NO HOMES
NO FOOD
NO WATER
NO VACANCY!





of the

COCKROACH
CLEAN-UP
TOUR
and
THE ROACHES!

LESSON 1

"It's a Roach's Life"

(This lesson is best presented in conjunction with the Cockroach Monitoring lesson.)

Concept: Controlling cockroaches requires an understanding of their biology.

Subject: Science

Grades: K-6

Overview:

"Getting to know" a pest is a necessary first step in controlling it. The urban students of today will most likely inherit the cities of tomorrow—complete with the cockroach and rodent problems that so often trouble our urban areas. A basic understanding of these pests is more than simply a biology lesson—it's a first step in creating a more healthy environment for the cities of the future.

Objective:

Students will be able to recognize the German cockroach in its adult and nymph forms.

Background Information:

Cockroach identification is relatively simple with the aid of the drawings contained in this lesson. The German cockroach is the most commonly-trapped roach in this area and can be easily distinguished by the parallel, dark stripes running lengthwise down the back of its "head." The female German cockroach carries an average of 37 young in an eggcase on her back, which she randomly drops 1 to 2 days before the eggs are ready to hatch.

Upon hatching, the young (called **nymphs**) disperse on their own and grow—outgrowing their skins and moulting 6 to 12 times before attaining the adult form and size. Once they have reached adulthood (in approximately five weeks), they can mate and produce their own offspring. This cycle can result in one German cockroach producing up to 400,000 young in one year!

Activity:

- Distribute copies of the attached "It's a Roach's Life" and discuss a cockroach life cycle with the class.
- Compare the cockroach life cycle with that of other insects. Note that some insects (such as the butterfly and the dragonfly) undergo complete metamorphosis and change form completely, while other insects (such as the cockroach and the grasshopper) undergo gradual metamorphosis and merely shed skins as they grow larger. (Consult the attached bibliography for reference materials if you would like to explore this topic at greater depth.)

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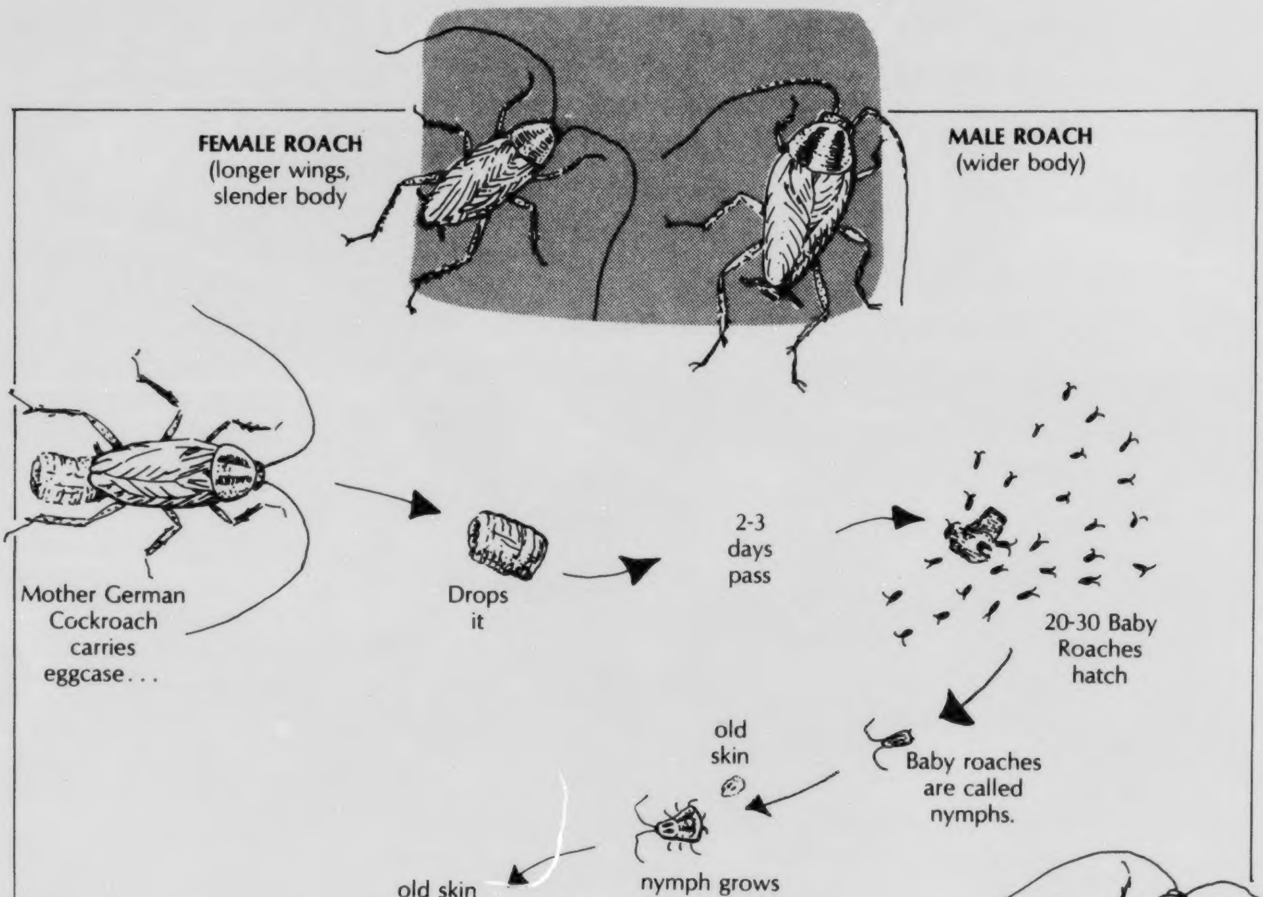
Variations:

Examine roaches that have been trapped as part of the Cockroach Monitoring Lesson. Give each student the opportunity to observe and identify the different stages. Have them record their observations with sketches and/or by compiling the information on a simple form. For example:

TRAP LOCATION	TOTAL # OF ROACHES	# MALE	# FEMALE	# NYMPHS	# EGG CASES

LESSON 1 HANDOUT

"It's a Roach's Life"


FEMALE ROACH
(longer wings, slender body
MALE ROACH
(wider body)
Mother German Cockroach carries eggcase...
Drops it
2-3 days pass
20-30 Baby Roaches hatch
Baby roaches are called nymphs.
old skin
nymph grows larger, sheds its skin for larger one
old skin
This process is called a MOULT.
Nymphs moult 4-6 times as they grow
After its final moult, the nymph becomes "adult" complete with wings
...and about to drop HER first eggcase!

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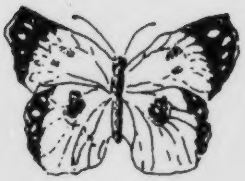
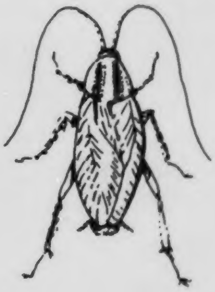
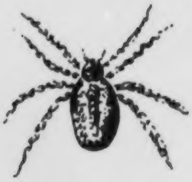
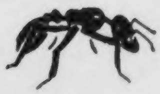
"It's a Roach's Life"

1. Circle the picture of the cockroach.

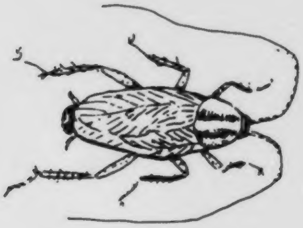


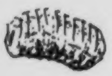


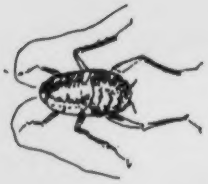




2. Label these pictures using the words listed below.







______________ ______________ ______________

nymph
cocoon
adult cockroach
eggcase
cockroach trap
spider

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LESSON 2

"Monitoring for Cockroaches"

Concept: Controlling cockroaches requires an understanding of their biology.

Subjects: Mathematics and Science

Grades: 4-6

Overview:

Cockroaches are as much a part of "nature" as are eagles, white-tailed deer, and man. They can be surveyed, collected, studied, and understood in many of the same ways. A basic understanding of roach biology is necessary for control and prevention. In this lesson students monitor cockroach populations at home and/or in the school to gain this understanding firsthand.

Objective:

Students will demonstrate an understanding of German cockroach biology by showing that they know appropriate locations for cockroach traps. Students will also be able to collect data over a period of time on a simple monitoring form. Advanced students will be able to display this information on a line graph.

Background Information:

Cockroach traps (commercially known as "Roach Motels") can be used to monitor German cockroach populations and as part of a program to control small infestations. They consist of small cardboard boxes that open at both ends. The insides are painted with sticky glue impregnated with a chemical that mildly attracts German cockroaches. (Although there are no poisons associated with the majority of these products, it is prudent to check the label of the specific product that you are using.) The box opens for observation, permitting counting and identification of the insects trapped inside.

Trap placement will greatly affect the success of a roach trapping program. Since the trap attractant is very mild, it is important to place the traps where the roaches prefer to travel: along baseboards, in corners under sinks, under appliances, near cracks—wherever German roaches can travel or hide in the dark.

Monitoring data is collected by periodically opening the traps, counting the number and type of insects trapped inside, and recording this information on a monitoring record (such as the one provided in this lesson).

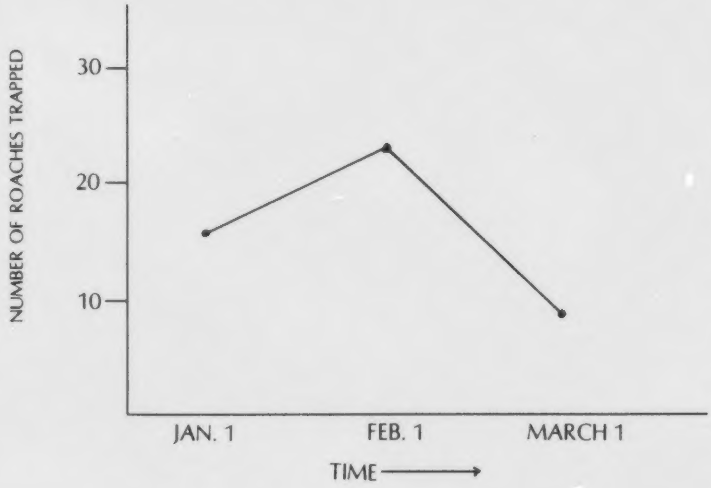
Activity:

- Buy or make (see attached "Cockroach Trap Instructions") a cockroach trap for each student. Discuss where the trap should be placed and why.

- Give each student a monitoring form and be sure that everyone knows how to enter data onto the form properly. Show the students how to open the cardboard box traps to check for roaches.

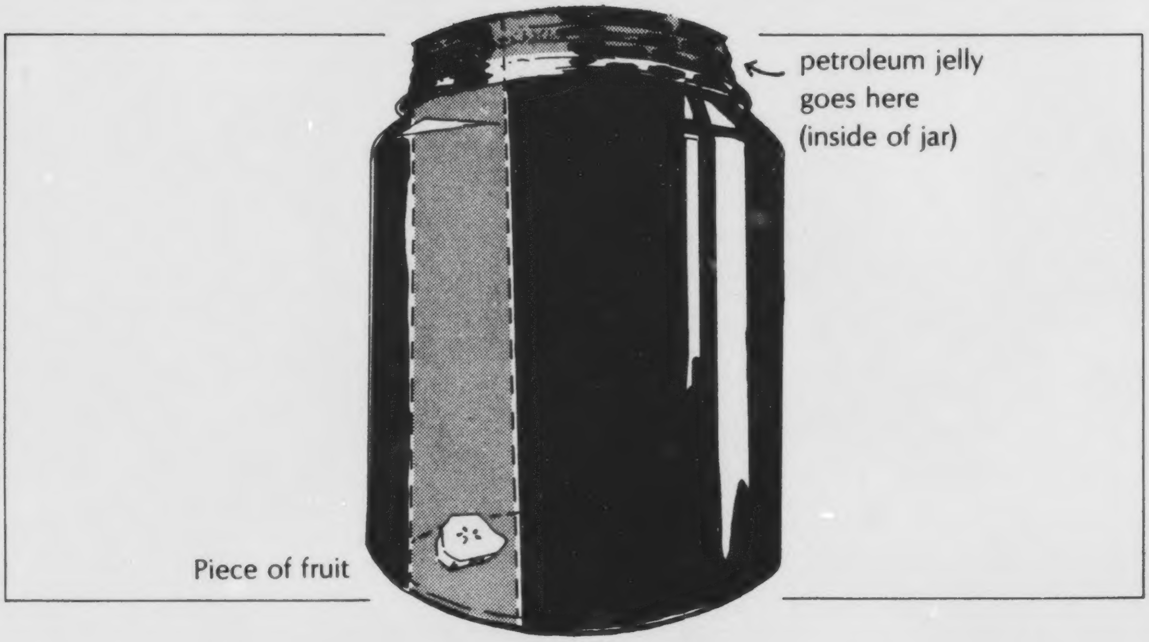
Extensions:

- Advanced students can be shown how to construct a simple line graph and plot their data upon it.



- Present this activity in conjunction with the Cockroach Clean-up Tour guided walk and/or slide program. Have the students help their parents use the techniques described in the tour to reduce roach populations. Students can then monitor and record the population as it declines. Their monitoring data will document the relative effectiveness of the various steps of the control strategy.
- Present this lesson in conjuction with the "It's a Roach's Life" lesson. Have the students identify the various roach life stages that they find in their traps and enter this information on their monitoring logs as well.

Cockroach Trap


petroleum jelly goes here (inside of jar)
Piece of fruit

A simple cockroach trap to catch common household cockroaches can easily be made from a jar, as pictured above.

How to make a cockroach trap:

1. Any jar with a lip can be used. Since cockroaches like dark places, the jar should either be placed in a dark place, painted black, or covered with dark paper.
2. Inside the jar place a small piece of banana, apple, or peanut butter for bait. Just drop it in the bottom of the jar.
3. Around the inner lip of the jar place a thick ring of petroleum jelly.
4. Now you are ready to place your trap standing upright in a favorite cockroach congregating area or travel route.

How the trap works:

The smell of bait inside the jar will attract cockroaches to fall into the jar. When they try to climb out, the ring of petroleum jelly around the inner rim of the jar will stop them. Roaches can be killed by putting the lid on the jar and then placing it in the freezer for 1 day.

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LESSON 2 HANDOUT

Roach Monitoring Form

Instructions:

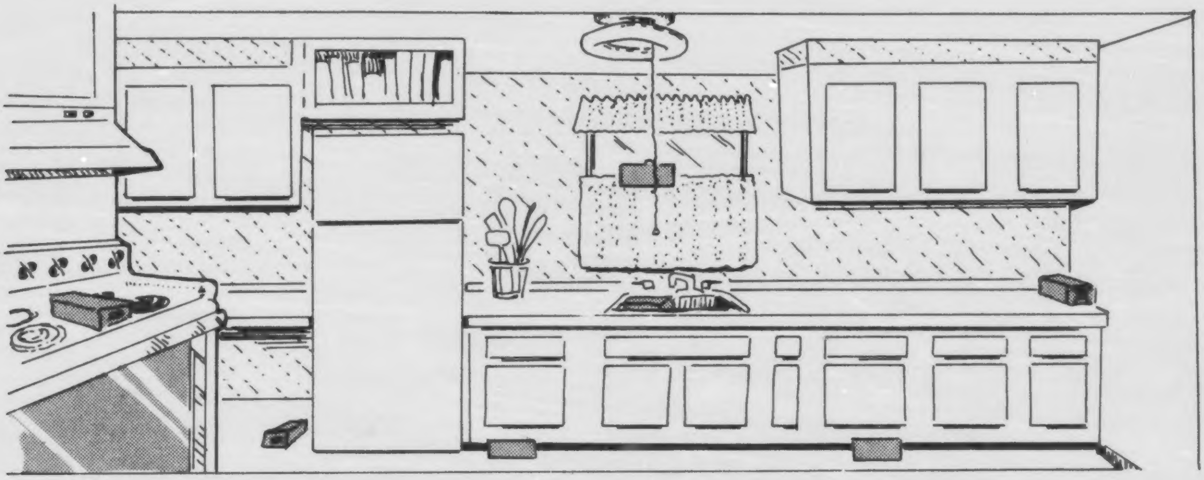
Write the location of each trap under "Location #" in the left-hand column. Each time that you check your traps, write the date in one of the boxes across the top of the chart and record the number of roaches found in each location of that date in the boxes underneath it.

DATE							
LOCATON # 1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

LESSON 2 QUIZ

Monitoring for Cockroaches

1. Several cockroach traps have been placed in the kitchen below. Circle the traps that have been placed in suitable locations. Put an "X" on the traps that have been unsuitably located.

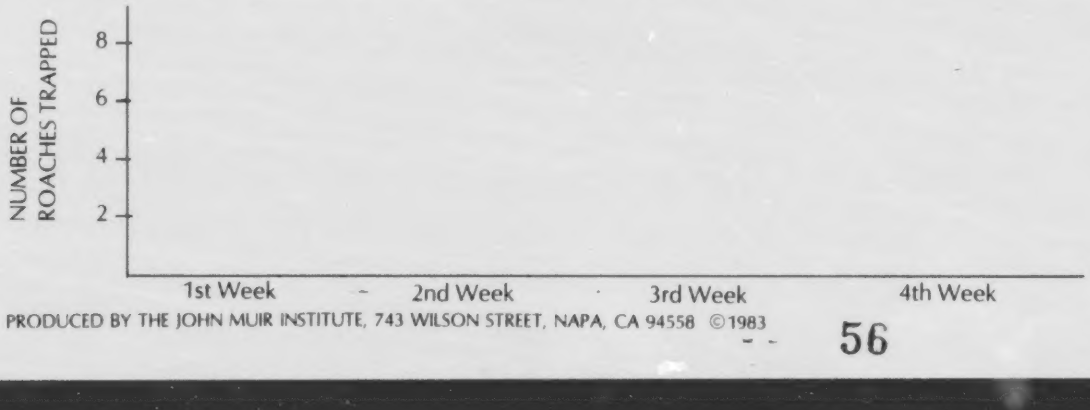


2. Suppose that you have set 5 cockroach traps in your kitchen. You look inside the traps (to see if you've trapped any roaches) once a week for four weeks. The first week you count 3 roaches; the second week you find 7 roaches; the third week you find 8 roaches; the fourth week you again find 8 roaches. Enter your findings on the following monitoring chart: (Warning! Remember that the roaches caught in previous weeks stay in the traps!)

NUMBER OF ROACHES TRAPPED

1st Week	2nd Week	3rd Week	4th Week

3. Enter the above information on the following line graph:



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LESSON 3

"What's Bugging You – and WHY?"

Concept: Removing the necessary components of a pest's habitat reduces the pest.

Subject: Language Arts and Humanities

Grades: 1-3 – "What's Bugging You"
4-6 – "Pest Puzzle"

Overview:

This lesson is designed to be used in conjunction with either the "Cockroach Clean-up Tour" poster tour or slide program. Its purpose is to give students the opportunity to practice using their newly-acquired pest control vocabulary.

Objective:

Students will be able to demonstrate a basic understanding of key words involved in cockroach habitat modification and identify the necessary components of a cockroach's habitat.

Background Information:

Like all living organisms, cockroaches require food, water and a suitable place to live and breed. Having originated as tropical insects, they additionally require warmth. They also prefer to live in cracks, where they typically hide their bodies while continuing to sense the outside environment with their two long antennae.

Activity:

This lesson reinforces new concepts and vocabulary acquired through participation in the poster tour or slide program. Two word-puzzles augment this lesson: "What's Bugging You?" aimed at the Lower Elementary level, and "Pest Puzzle", aimed at the Upper Elementary level.

After each student has an opportunity to complete his/her puzzle, the class should discuss the answers. Younger students can be encouraged to color the puzzle as well.

Variations:

Students can be asked to incorporate each word in a pest-related sentence, drawing or short paragraph.

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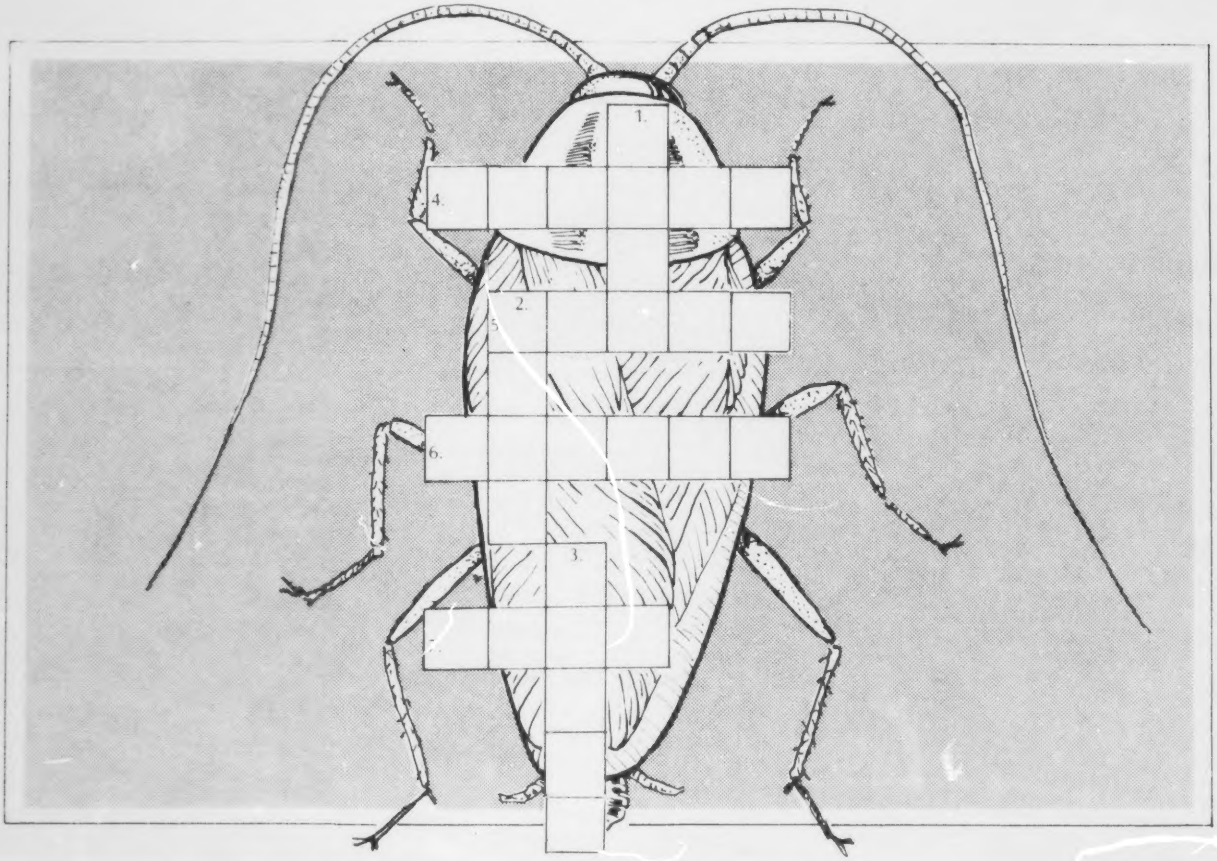
"What's Bugging You?"



DOWN

1. An insect that "bugs" us is called a ______________________

2. Cockroaches like to live where it is ______________________

3. A short name for cockroach is ______________________

ACROSS

4. A cockroach is a kind of ______________________

5. A leaky faucet gives cockroaches ______________________

6. Cockroaches like to live in narrow ______________________

7. We help keep roaches alive by giving them ______________________

CHOOSE FROM THESE WORDS:

- water • insect • pest • cracks • roach • food • warm

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Pest Puzzle

Find the words listed below in the puzzle. They can be circled horizontally, vertically, or diagonally, backward or forward. Check them off when you have found them. (The first word has already been done for you.)

O	B	A	W	T	F	O	T	I	C	A	E
H	C	O	C	K	R	O	A	C	H	U	W
A	P	O	R	T	A	T	I	B	A	H	A
N	E	N	V	I	R	O	N	M	E	N	T
Y	S	B	R	F	C	A	S	T	V	Y	E
M	T	U	E	W	A	A	E	M	I	M	R
E	G	G	A	G	U	W	C	E	N	P	T
C	A	S	E	G	L	O	T	I	V	H	G
N	T	U	H	R	K	F	O	O	D	N	E
E	B	M	P	A	R	T	H	C	A	O	R

✓ cockroach
______ boric acid
______ roach trap
______ water
______ food
______ nymph
______ insect
______ waste
______ egg case
______ pest
______ habitat
______ environment
______ bug
______ caulk

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LESSON 3 QUIZ

"What's Bugging You – and WHY?"

Fill in the blanks in the following sentences, using words from the list at the bottom of the page.

1. Cockroaches like to live where the temperature is ____________________.
2. An organism's home is called its ____________________.
3. A leaky faucet can provide a cockroach with ____________________.
4. Narrow ____________________ provide hiding places for cockroaches.
5. To stay alive, a cockroach needs to get __________________, water and shelter from its habitat.

cold
habitat
water
nest
clothing
food
warm
cracks

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LESSON 4

"Finish the Story"

Concept: Proper food/waste management reduces pests by removing the food available to them.

Subject: Language Arts & Humanities

Grades: K-6 (can be modified to a level appropriate to the students).

Overview:

Most students will grow up to be adult members of the urban environment. As city dwellers, they will most likely be faced with some of the pests commonly found living along with humans in the city. In this lesson students examine the relationship between pests and available food in an urban home setting, in order to identify ways that pests can be managed by proper food/waste management.

Objective:

Students will be able to identify pest-supportive situations in a typical home environment and suggest appropriate remedies.

Background Information:

Pests, like all other living organisms, require food in order to stay alive and breed. A really "successful" pest (like the cockroach) is able to subsist on many different types of food, including paste, soap, paint, table scraps, pet food, and candy. Nonetheless, roaches can be drastically reduced merely by limiting the amount of food made available to them.

Activity:

Write the following paragraph on the board and ask the students to complete the story in writing. Younger students can be read the paragraph and asked to respond orally or by drawing pictures.

Story:

John came home from school and made himself a peanut butter sandwich. He left the dirty knife and the empty peanut butter jar on the counter and went into the living room to eat his snack. While watching television a few crumbs fell on the carpet, but they seemed too small to bother with.

After eating, John returned to the kitchen and tossed his sandwich crust into the wastepaper basket. He filled the cat's dishes with food and water and set them on the floor next to the sink.

As John was leaving the kitchen, he noticed a small brown bug scurry along the kitchen counter.

"I'll have to tell my parents to get some bug spray," he thought. "We'll have to get rid of those cockroaches!"

Now let's have John come home again. What could he do **differently** that wouldn't encourage roaches?

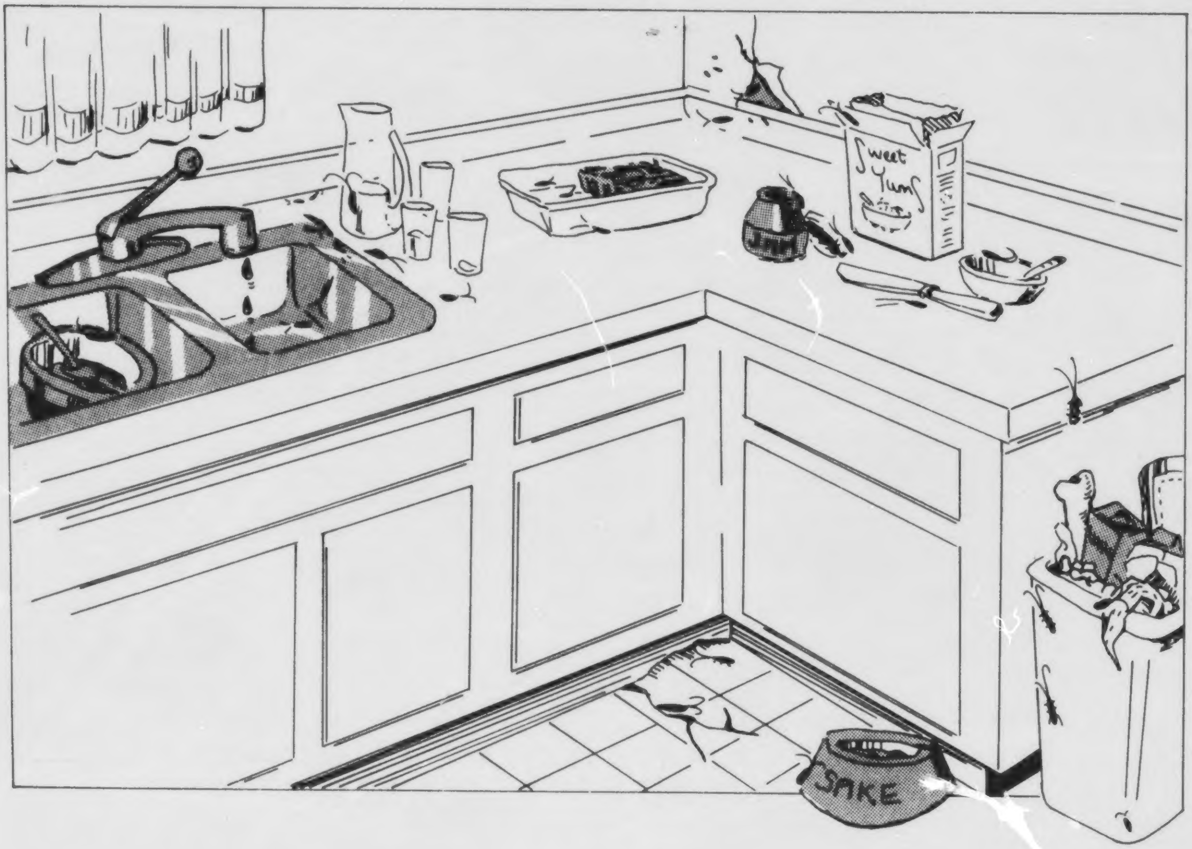
(SUGGESTIONS: Wash or soak dirty dishes, wash and recyle empty glass jars, restrict food to fewer eating sites, set the pet food dish in a larger dish of soapy water, (or remove the pet food immediately after the animal has eaten), separate organic trash from waste paper and tightly enclose the organic materials.)

Variations:

- Have each student describe (orally or graphically), what he/she could do to reduce food sources for cockroaches in his/her own home.
- Have the students draw sequential pictures depicting this story. (Older students might draw sequential pictures of how John should have acted upon coming home.)
- Tour the school (especially the lunchroom and lounge areas) and identify potential and actual roach food sources. Ask the students to suggest alternatives.

"Finish the Story"

1. Look carefully at the picture below. Draw a circle around everything in this picture that would attract cockroaches.



2. Select three of the problem spots that you circled. Write one sentence for each problem describing what you could do to make it less attractive to roaches.

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LESSON 5

"Are You 'Wasting' Away?"

Concept: Proper food/waste management reduces pests by removing the food available to them.

Subject: Mathematics

Grades: K-6

Overview:

People rarely give much thought to the materials that they consider to be "waste." This lack of awareness has contributed greatly to the incredible amount of "garbage" that each of us in this country discards each day, as well as to the rodent population in our cities. In this lesson, students will examine and record the waste generated by a "picnic" lunch that they bring to school. They will then evaluate the "leftovers" and discuss possible ways to dispose of them that discourage pests from feeding upon the organic materials. Additional activities help students consider the potential value (monetary as well as social) of recyclable materials.

Objective:

Students will be able to differentiate between the different types of materials commonly found in a trash can, and identify those most likely to attract pests. They will be able to describe ways to dispose of waste that discourages pests. They will also be able to record quantities on a simple bar graph.

Background Information

Each year, Americans throw away over 387 billion pounds of "garbage." Approximately 11% of this "waste" is organic material that urban pests (such as rodents) are delighted to share with us. Another 50% is paper, metal and glass that could be recycled into new products. Mixing reusable resources with organic garbage also generates larger volumes of garbage that needs to be stored away from hungry pests. The key to avoiding these problems is in one word: SEPARATE.

1. **Separate** organic from inorganic. Store organics in tightly sealed containers.
2. **Separate** recyclables from nonrecyclables (depending on local programs).

Activity

- Set aside a lunch period for this activity. Several days prior to this date, send notes home with the students asking that each child bring a picnic lunch to school that day. The teacher should also pack a lunch, being sure to include some items made of glass and aluminum (e.g., a jar and aluminum foil) in his/her lunch. (Note: It might be wise to do this activity with another class so that sufficient "garbage" will be generated by one lunch.)

- After the class has eaten, lead a brief discussion of "garbage":

  What is it?
  Who makes it?
  Where does it go?

- Announce to the class that you will all now separate your "garbage." Lay five large paper bags out on the floor. Each bag should be labeled with one of the following: "Food," "Paper," "Aluminum," "Glass," and "Other." With the children's participation, separate the remains of your own lunch into the five piles, noting the differences between each category as you do so. (Note: Non-food products such as paper plates that have food on them should either be washed clean or placed with "food" items. Anything that is edible needs to be stored where pests can't get at it.) Then have each child come to the front of the room and divide his/her lunch remnants among the piles.
- Discuss waste as a pest management issue. The following topics might be helpful:

1. Which of these piles would attract pests? Which pests and why? (Everything likes food—mice are also attracted to paper products as a nesting material.)
2. How could trash separation help control pests? (Removing the inorganic from the organic material makes it easier to store the food wastes that pests find most attractive.)
3. How could the organic material be kept away from pests in the home? (Food scraps can be stored in a tightly-lidded plastic container until garbage collection day.)
4. What problems arise when food scraps are put out for the garbage truck in plastic bags? (Hungry dogs and rats tear the bags open and scatter the garbage.) What can be done to prevent these problems? (Organic garbage can be stored in metal cans that have tight lids or spring fasteners on them to hold the lids on when knocked over.)

- Ask the students to consider the inorganic ("non-food") materials:

  Which of these materials could be cleaned and then reused? (e.g., storage jars, plastic cups, aluminum pie tins, plastic bags.)

  Which could be "recycled"? (i.e., remade into a new product.) Examples: paper, glass and aluminum.

  What are our "natural resources"? (Trees, minerals, metals, etc.) What will eventually happen to these resources if everything is used once and then discarded?

  What is a "dump?" What happens to natural resources when they are used and then dumped? What will happen to the size of our dumps? What will we do then?

- Weigh and count each completed pile. Hand out copies of the attached graph to the students (one per student) and have them record the weights or numbers of each pile appropriately.

Variations/Extensions

- Take a field trip to the school lunchroom at a convenient time for the lunchroom staff. Cut open three clean garbage bags (as big as possible) and spread them on the floor. Label one "Recycle", one "Organic Waste," and one "Other." Wearing rubber gloves, remove the contents of the lunchroom garbage pails one at a time. As you remove each item, show it to the students and ask them which bag it belongs in.

  Organic Wastes: anything that decomposes. (Food, cigarettes, soiled paper napkins, etc.)
  Recyclable: paper, aluminum (plates, trays or foil), glass, etc.

- Discuss what would have to be done to make the recyclable materials usable (wash, bundle, separate paper from plastic or metal, and/or remove lids).
- Appoint task forces of approximately five students each:

One to monitor and record the "organic/recyclable/other" contents of the lunchroom trash can each week.

One to arrange for five separate trash cans in the lunchroom labeled "paper," "glass," "aluminum," "food garbage," and "other."

One to make posters for the lunchroom explaining why trash separation is important.

One to call the nearest recycling center, arrange for pick-up of the recyclable materials, and report back the value of the materials collected. (Note: It is important to call the center before you begin this activity to find out what types of paper, aluminum, etc., they accept and how it has to be packaged.)

- After 1-2 weeks, have each group report to the class. Consider expanding the program to include the rest of the school.
- Compare the original graphs to current waste levels, now that people are more aware of their "garbage" and its value.
- Older students may be able to extend the recycling program to their neighborhood. (This could take the form of a paper and glass recycling fundraising drive with the School/Parent Organization.)
- Discuss recycling as a benefit to your community:

  It saves money by reducing garbage pick-up.

  It discourages rodents by reducing the amount of garbage to be stored between collections.

  It returns money to the community instead of siphoning it off into the garbage dump.

  It conserves our natural resources.

- Suggest that the students separate trash in their own homes. If your community has a recycling center, encourage participation. (A list of regional recycling centers is given with the bibliography.)
- Discuss ways to recycle the organic waste. In the summer it could be "recycled" as a compost heap. This might be a project that your class could undertake, either as a fundraiser (providing compost to community gardeners) or to fertilize a garden of its own. (A small compost bin is fairly easy to construct and maintain.)

Recycling Mathematics

1. A local paper mill will buy used newspapers for \$20.00/ton. Your class collects 300 lbs. of newspaper as part of a fundraising drive. How much money will you collect?
   (Hint: 1 ton = 2000 lbs.)

2. The glass company will pay you 1¢ per pound for green glass, 1½¢ per pound for brown glass, and 2¢ per pound for clear glass. You bring them 20 lbs. of green glass, 10 lbs. of brown glass and 50 lbs. of clear glass. How many pounds of glass did you bring them? How much money will they give you?

3. In 1981, the FEAT Foundation Recycling Center helped the people of Flint, Michigan to recycle 400,000 pounds of newspaper, 100,000 pounds of glass, and 750 pounds of aluminum. The average garbage bag holds 15 lbs. of waste. How many more bags of garbage would have been picked up in Flint if these people hadn't recycled?

4. In 1980, the city of Flint spent \$300,000 to collect and dump newspapers, glass, and aluminum. If these materials had been recycled, \$200,000 could have been returned to the city from their sale. How much money did the city lose in total by not recycling?

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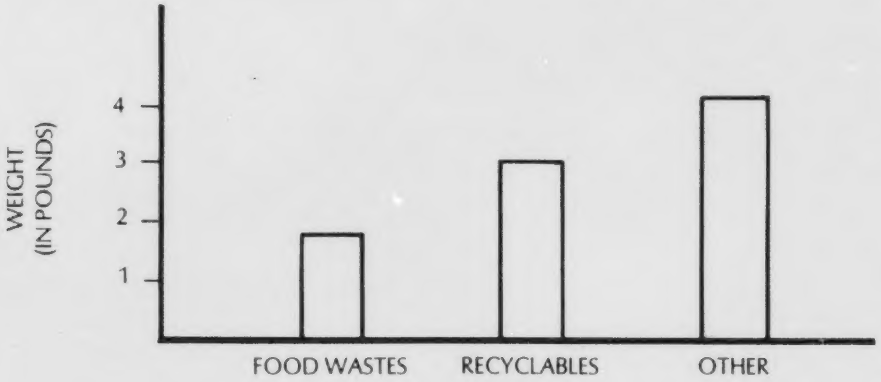
What's in a Trash Can?

1. Record the weights of each type of trash on a bar graph (like the one below).



2. Which fraction of the trash is recyclable? Which fraction is food waste? Which fraction is most attractive to pests?

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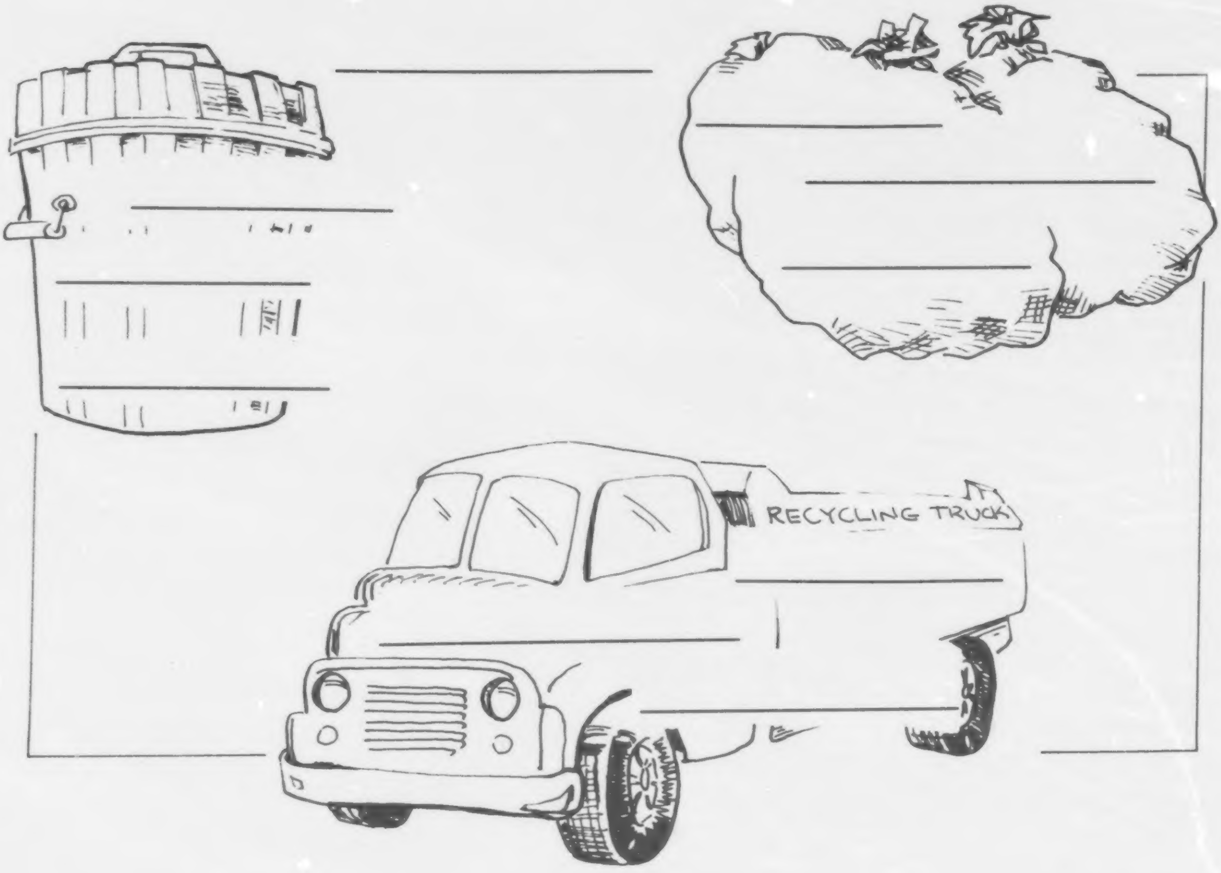
LESSON 5 QUIZ

"Are You 'Wasting' Away?"

1. Divide the following leftovers into the correct "piles".

bread crust
newspaper
clean and empty cottage cheese container (plastic)
clean aluminum pie plate
apple core
broken toy doll (too broken to repair)
clean and empty peanut butter jar
empty bread bag
banana peel



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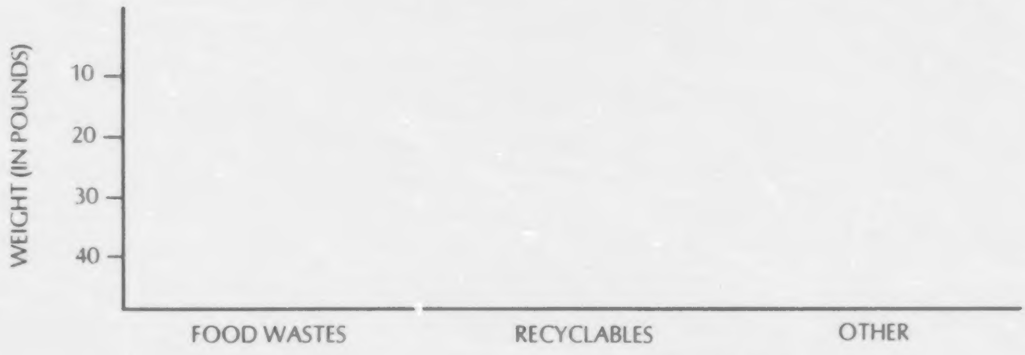
2. Make a list of the words in #1 that are names of things that might attract pests and briefly describe a way to keep pests from eating these things.

3. Draw a line connecting the following words with their correct meanings.

• organic	• Materials that **don't** decompose (such as plastics, rocks and metals).
• dump	• Materials that can be recycled.
• inorganic	• To make new products out of old, discarded ones.
• recycle	• Materials that decompose (such as food, most cloth and paper).
• recyclable	• A place where discarded objects ("garbage") are piled, compacted, and covered with dirt.

4. A school's dumpster holds 20 pounds of food waste, 30 pounds of recyclable materials and 40 pounds of assorted trash. Record this information on the following bar graph.



LESSON 6

"What's In A Home?"

Concept: Removing the necessary components of a pest's habitat reduces the pest.

Subject: Science

Grades: K-3

Overview:

Everybody knows what a "home" is. What's not so obvious is the fact that every living thing needs a very special environment to live in: its "home" or "habitat". This lesson makes the students aware of the fact that **humans** have certain habitat needs, and then expands this understanding to a discussion of the needs of other species—particularly of species that can become pests.

Objective:

Students will be able to list three necessary components of an organism's habitat. They will also be able to give specific examples of these components for the cockroach, and suggest ways to remove them.

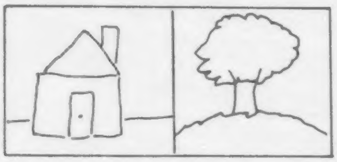
Background:

Every organism requires food, water, and a suitable place to live and breed. When these needs aren't met, the species either migrates to a more suitable location or is able to adapt to use other forms of food, water and shelter still available—or it dies. Species that can't move or change quickly enough (like the dinosaurs) become extinct.

An organism makes a place its home because it can find food, water and shelter there. Providing these necessities can entice a welcomed species (e.g. white-tailed deer) to move into an area. Removing these necessities will force the organism to adapt, move away or die. Species that have become pests can be controlled by removing the elements that make them call a location "home."

Activity:

- Ask the children to suggest things that they need in order to stay alive. List or draw these on the board.
- Have each student take a piece of construction paper, turn it sideways, and divide it in half with a vertical line.
- On the left side of the paper, instruct the students to draw an outline of a simple house. On the right side, have them draw one or more simple trees.



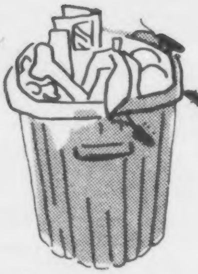
- Explain that each of these sketches represents a **habitat** and that each is "home" for different types of creatures.
- Discuss possible sources of food, water, and shelter in each of these habitats.
- Ask the children to suggest different animals, insects and plants that would be happy living in one or the other of the two environments.

Suggestions: House – humans, mice, spiders, house plants (if watered), pet birds (if fed and watered), cockroaches, flies.
Forest – trees, birds, mushrooms, deer, mice, spiders, humans, squirrels.

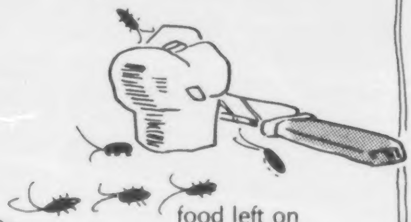
- List the things that they suggest on the board. Ask where each of these organisms would find food in its habitat.
- Discuss the differences between the two habitats. (Who or what produces the food in each of the habitats?)
- Have each child draw at least two animals and their food in each of the habitats (e.g., girl eating sandwich and mouse eating trash on the left side, bird eating worm and squirrel eating nut on the right side).
- Distribute copies of "Cockroach Likes and Disklikes". Discuss the ways that a cockroach's habitat can be changed.
- Instruct the students to compare the pictures on the sheet with their own homes. Discuss things that they can do to make cockroaches not want to live there.

Cockroach

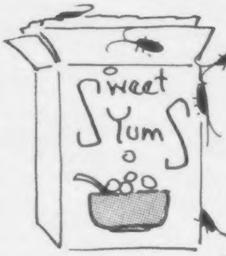
Likes



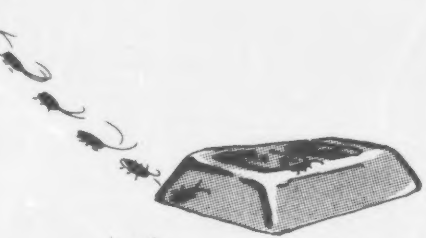
food in open trash containers



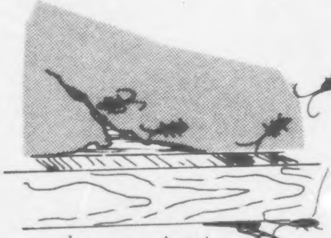
food left on counters and stoves and dirty dishes



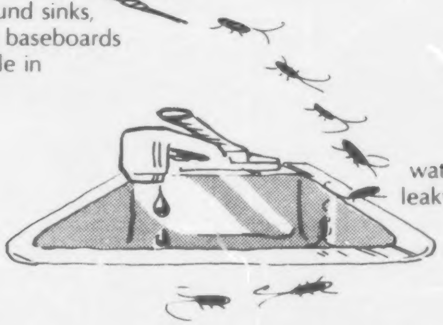
food stored in boxes



pet food left out

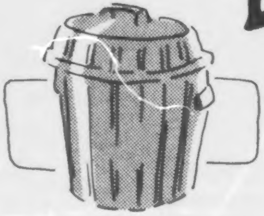


cracks around sinks, counters and baseboards to hide in

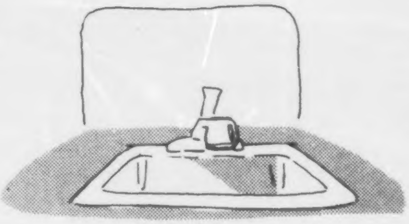


water from leaky faucets

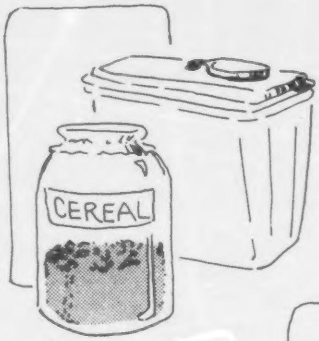
Dislikes



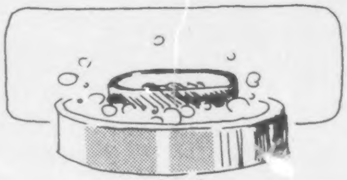
lids on food garbage containers



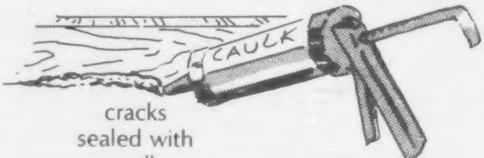
clean counters with dishes washed or soaking in soapy water



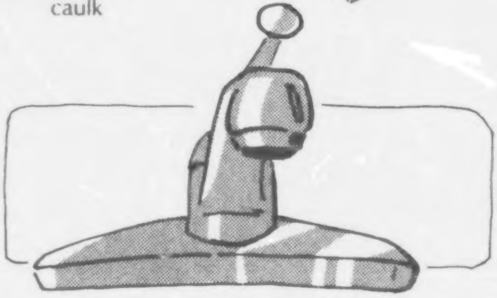
food stored in sealed containers



pet food in a bowl of soapy water



cracks sealed with caulk



leaky faucets repaired

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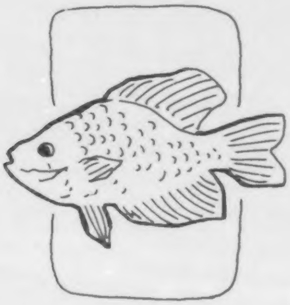
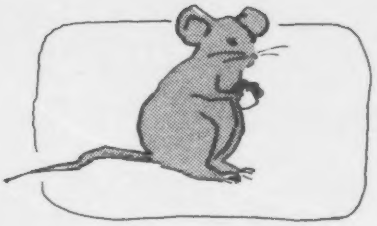
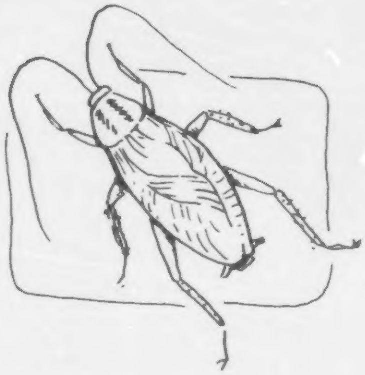
LESSON 6 QUIZ

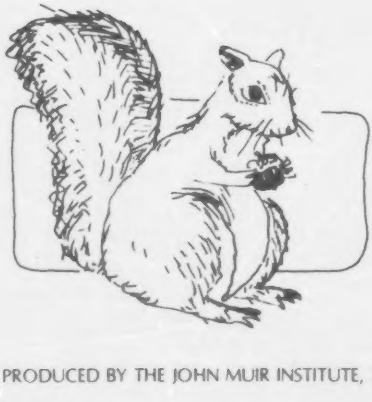
"What's In A Home?"

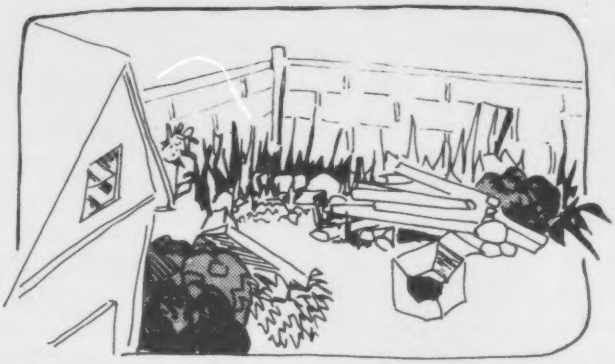
1. Match the animal with its home. Color pictures, cut out and paste on a separate page.

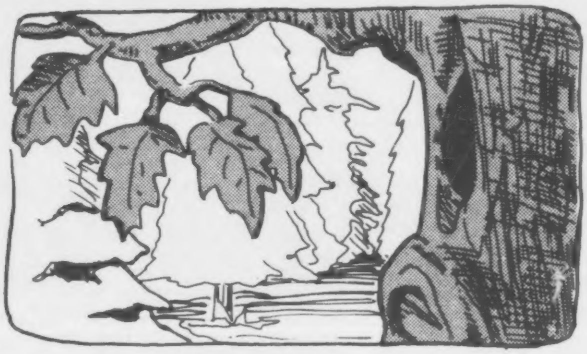


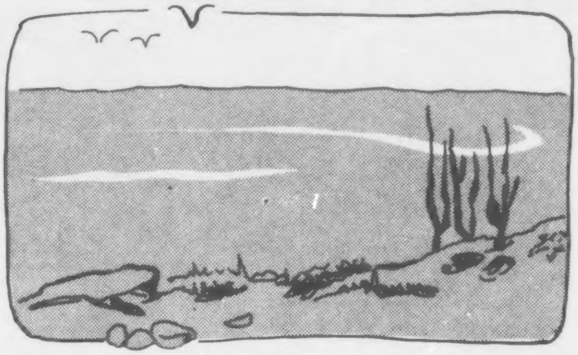


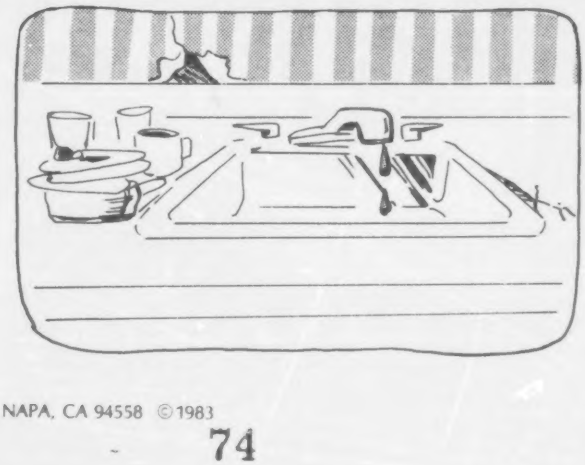












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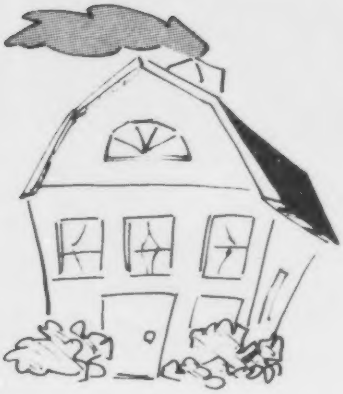
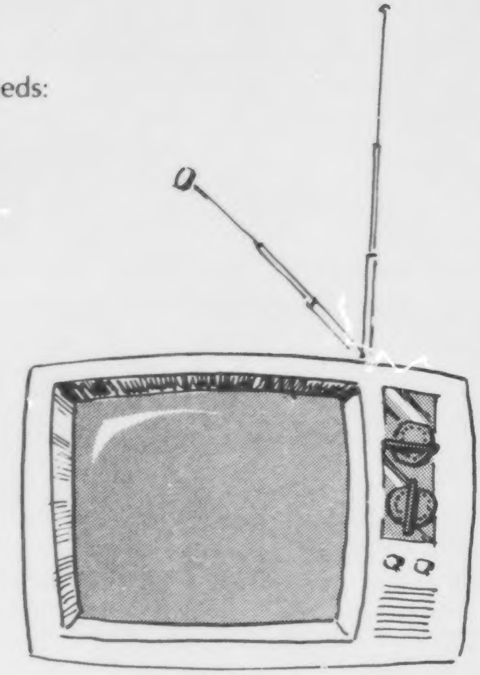
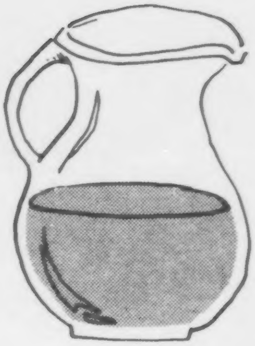
2. Circle the pictures that show the 3 things that every creature needs:



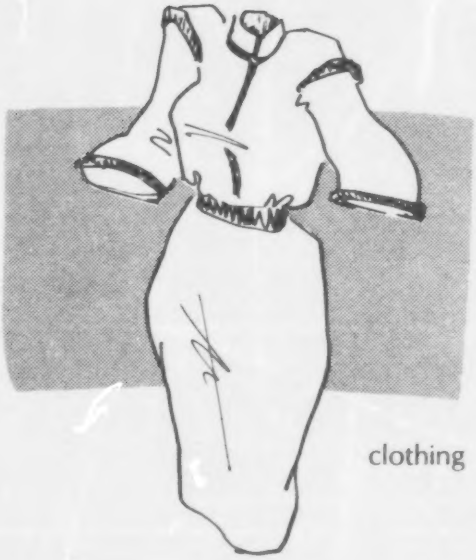
a place to live



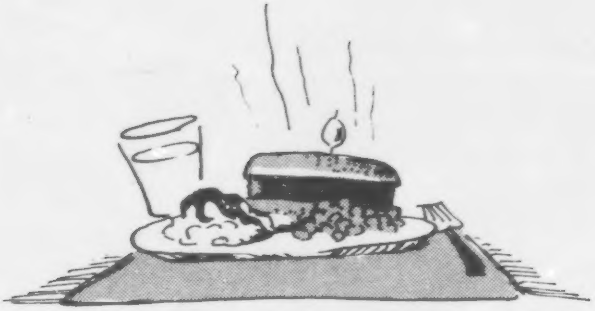
a television



water

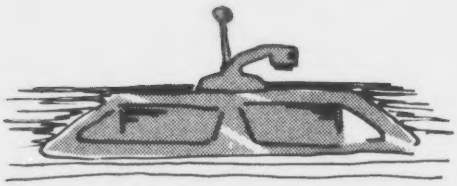


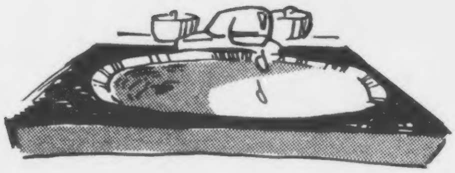
clothing

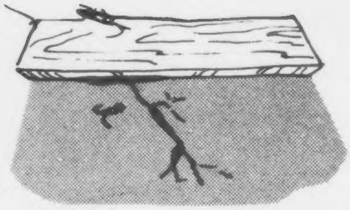


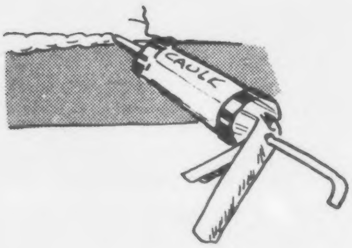
food

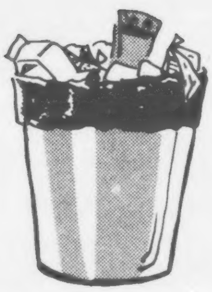
3. Circle the things that a cockroach would like. Put an "X" on the things that a cockroach would **not** like.

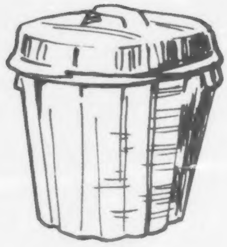












LESSON 7

"Choose Your Environment"

Concept: An environmental system is made up of many interconnected organisms that support one another. Humans can change an environment to make it more or less supportive of themselves or any other organism.

Subjects: Social Studies and Science

Grades: K-3

Overview:

Every living thing (including each of us) is part of a complex network. Each organism depends upon other components of this network for life, and in turn, functions in a role of its own. Human beings are among the very few organisms which are able to consciously change their environment–for better or for worse. By becoming more aware of our environment, we can become more aware of the ways that we can change it. Responsible and thoughtful change can make an environment a healthier and happier place in which to live.

Objective:

Students will be able to describe a preferred human environment and one that is less preferable. They will also be able to describe a cockroach's preferred environment and ways to change this environment in order to make it less attractive to roaches.

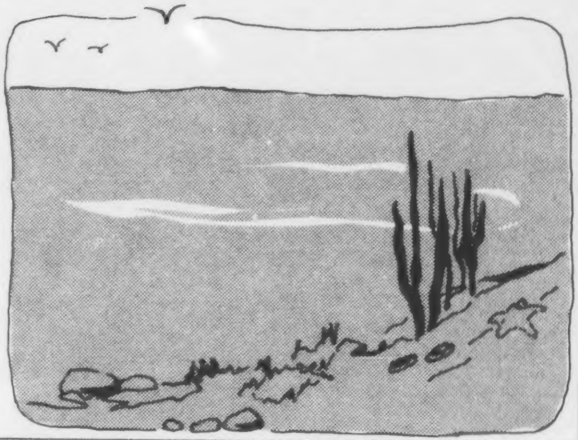
Activity:

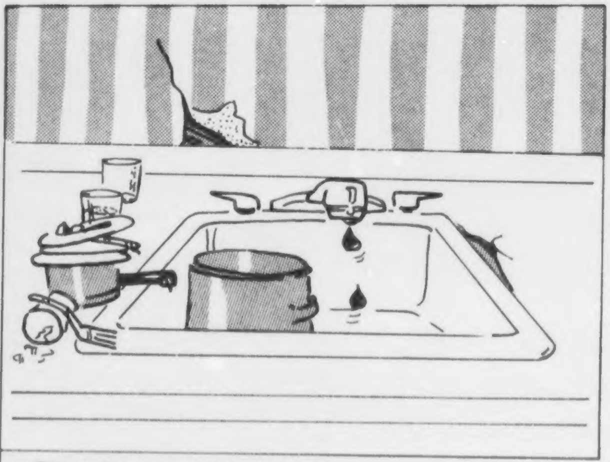
- For the week prior to this lesson, have the students bring in pictures of various attractive and unattractive environments, including such places as tenements, cottages, castles, cabins, modern suburban homes, etc. Encourage them to bring in as much variety as possible. Number the pictures randomly and display them about the room all week.
- Ask each student to write down the numbers of the five places where he/she would most like **not** to live.
- Have the children close their eyes and imagine a day in their favorite–and their least favorite–environment. Ask several children to share these "daydreams" with the class.
- Discuss the differences between these environments:
  What makes them different?
  Why do different people like different places? etc.
- Discuss characteristics shared by the majority of the students' favorite (and least favorite) places. What could a person in the least favorite place do in order to make it more like the favorite place?

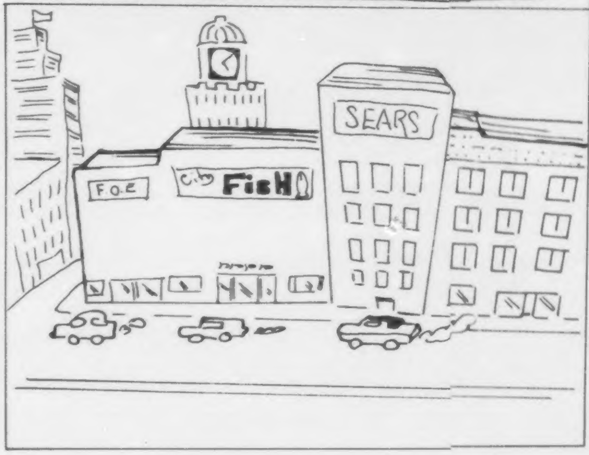
- Have each student name an animal typically found in his/her favorite environment. Discuss the environmental characteristics that would make it preferable to that animal. Would changing the environment to make it better for humans also make it better for the animals?
- Then ask the students to draw a picture of "A Cockroach's Favorite Environment" and describe its key components. Discuss the ways that this environment differs from a human's favorite place. (Does the presence of a human "ruin" the roach's favorite place? Why does the presence of a roach "ruin" the human's ideal home?)
- Ask the students to draw a picture of "My Favorite Environment." (Older students can be asked to write an essay.) Students can be asked to present the completed picture to the class along with an explanation of what makes it so special.

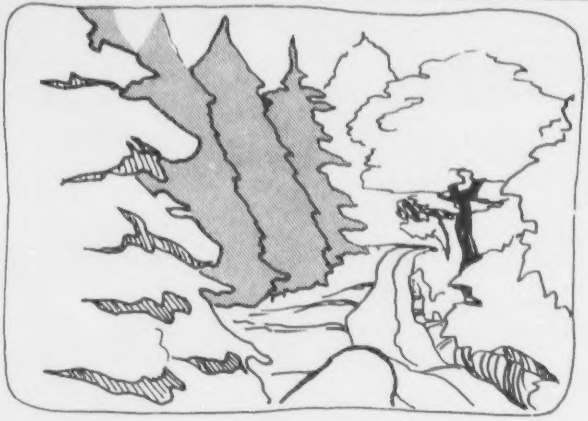
"Choose Your Environment"

1. Circle your favorite environment. Put an "X" on the environment that you **don't like** the most.



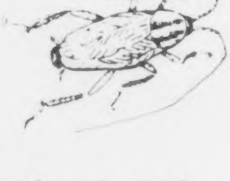






2. Where would this cockroach be happiest?

Draw a line from the roach to its favorite home.



3. Draw a picture of the roach's home after someone has fixed it up and made it a favorite place for humans again. (Use the back of this page.)

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LESSON 8

"My Neighborhood Network"

Concept: An environmental system is made up of many interconnected organisms that support one another. Humans can change an environment to make it more or less supportive of themselves or any other organism.

Subjects: Social Studies and Science

Grades: 4-6

Overview:

This lesson focuses on the interconnectedness of natural and social systems. Students will develop a better understanding of how much each part of an environment (urban or natural) depends upon every other part.

Objectives:

Each student will be able to name at least three components of the urban environment and discuss the role and interconnectedness of each.

Background Information:

"Environmentalists" are commonly thought to be people who are very concerned with saving wilderness areas. While this stereotype may have some truth to it, an environmentalist is really someone who understands that all habitats are interconnected—and that the wilderness area affects (and is affected by) the city. An environmental awareness accompanies the understanding that every decision to change something in an environment affects all other parts of that environment—as well as other environments that interconnect with the one being considered. Developing this awareness in a student may lead to a more responsible approach to environmental decisions when she/he becomes an active member of society.

Activity:

- Divide the class into 4 groups:
  1. Residents (homeowners, renters)
  2. Food Providers (food stores, farmers' markets, gardens, restaurants)
  3. Energy Providers (gas stations, power companies, firewood suppliers)
  4. Essential Service Providers (hospitals, police, fire stations)

(This activity could be introduced by asking the class to name major groups in the city environment, hopefully leading to categories similar to the ones mentioned.)

- Have each group discuss "its" role in the urban environment. (For example, the Food Providers could be various food stores, cafeterias, and restaurants. They provide food to the community in exchange for money provided by the Residents. They pay some of this money to the Energy Providers to keep their building heated and lighted. They also pay money (as taxes) to the Essential Service Providers to protect their buildings from crime and fire.)

- One member from one of the groups should go to the front of the class and describe his/her group's role. As another group is mentioned, a member from that group should go to the front of the class, touch the first person, and describe how they are linked. All possible linkages should be explored in this way until most of the class is standing entwined at the front of the room.
- Discuss what might happen if one of the groups vanished from the city. Have each student write a brief essay entitled "The Day That the ____________ (food stores, garbage collectors, police officers, streetlights, hospitals, etc.) Disappeared".
- Discuss the ways that the cockroaches depend on humans. For example, most cockroaches originally came to North America from Africa. They require a warm, moist habitat. Would they be able to find a suitable habitat all year long in your school if the heat or water were turned off? Where would they find their food?
- Talk about neighborhood pest problems, such as rats or mice. How does your neighbor's backyard affect your backyard? How does messy or infrequent garbage collection affect rodent population?
- A city is dependent upon more than its internal interconnections. What would happen to the city if the world outside of its boundaries vanished? How does a city's survival depend upon farms, railroad and highway systems, natural resource procurement and refinement, water availability and quality, air quality, etc.?
- Discuss the following scenarios and how their various outcomes might affect the lives of city dwellers:
  1. The supply of fresh food (including meat and dairy products) coming into the city is shut off when truckers/railroad workers/farmers go on strike.
  2. The city's dump becomes dangerously full (in part, because the city has had no recycling program). Communities surrounding the city for many miles refuse to allow the city to build a new dump near their homes. Burning the garbage can be very expensive and can create problems with air pollution. (Spaceships are usually too expensive to be practical.)
  3. A power plant that is located on the outskirts of the city provides 95% of the city's electrical power. Unfortunately, particles in the smoke exhaust coming from the plant's stacks are being carried high in the air and coming back to earth far away in the form of "acid rain." The acid rain is suspected of killing fish in the lakes as much as 700 miles east of the city. Fisherman are threatening to sue your city. Cleaning the power plant exhaust would be very expensive.

Variations:

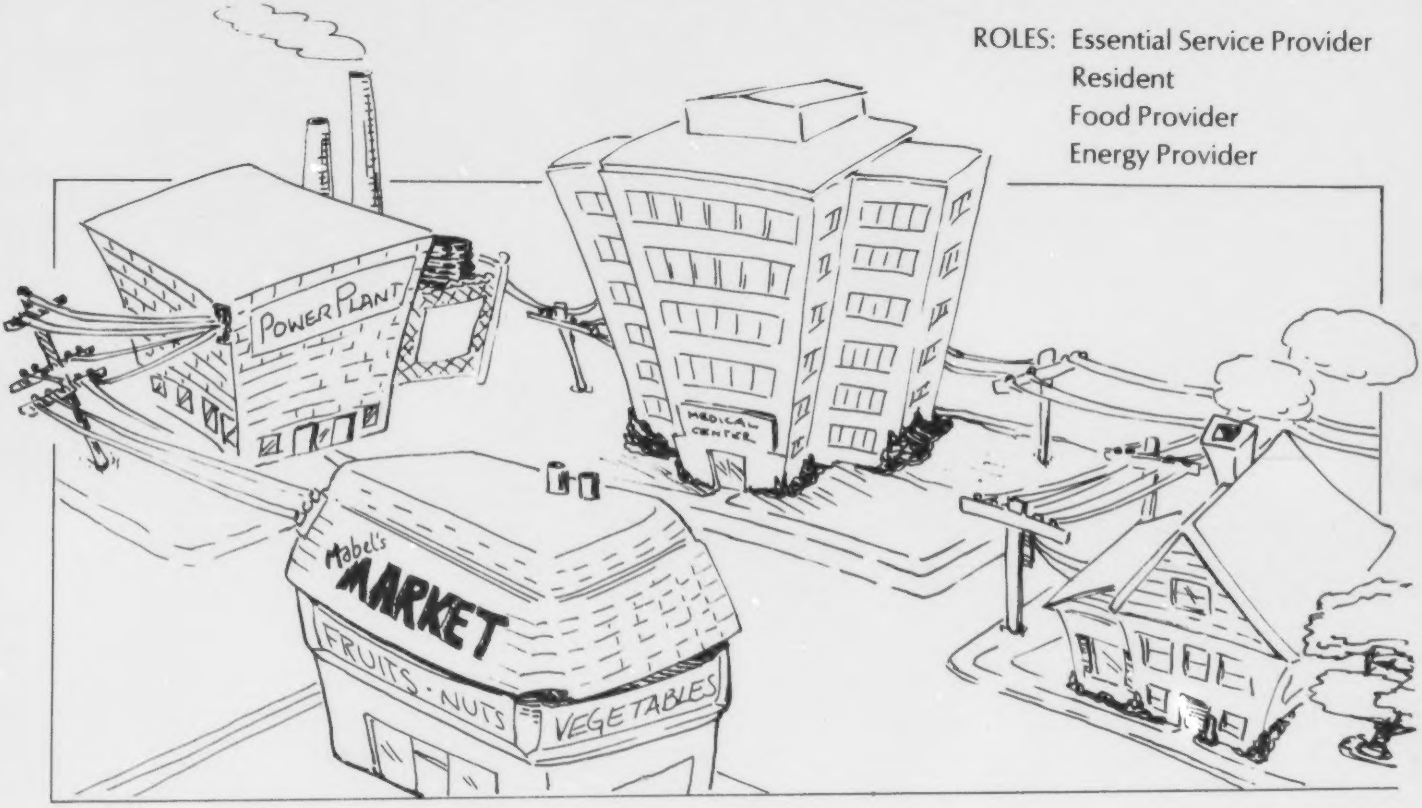
- Consider other environments and how their parts interconnect. For example, a forest environment consists primarily of food producers (plants), consumers (plant eaters and animal eaters), and decomposers (dead plant and animal eaters). Discuss how the removal of any of these components would change the entire system. (Consult the bibliography for reference materials if you would like to pursue this in more depth.)

LESSON 8 QUIZ

"My Neighborhood Network"

1. Which group of people works or lives in each of the buildings shown below? Pick the correct role for each from the list given below and write it under each picture.

ROLES: Essential Service Provider
Resident
Food Provider
Energy Provider



2. Pretend that you are in charge of collecting the city's garbage. Write a paragraph that describes how your work affects the people in each of the above buildings and how they affect you. (What would happen if you went on strike? What if all of the people started recycling their newspapers? How does your job affect the rodents in the city?)

Glossary

Boric Acid – A relatively low-hazard material that can be used as an insecticide against cockroaches. Boric Acid has no vapor while most other insecticides do. (Roaches learn to smell and avoid other insecticides.)

Caulk – A "gummy" material that can be used to fill cracks. Filled cracks deny habitat to the roaches.

Cockroach – Insects of the family Blattidae, commonly found in warm, moist climates or areas. Roaches are closely related to crickets.

Complete Metamorphosis – The insect changes its appearance in stages as it grows. Each stage is completely different. (For instance: egg→caterpillar→cocoon→butterfly.)

Compost Heap – A way of storing organic wastes so that they can be used as garden fertilizer.

Egg Case – A "package" of eggs carried or deposited by the female.

Environment – An interconnected support network that surrounds any organism.

German cockroach – species of cockroach commonly found near sinks and in the kitchen.

Gradual Metamorphosis – The insect grows continuously, shedding its old skin as it becomes too tight. Except for the egg case stage, the young look much like smaller adults.

Habitat – The plant or animal's home; the place where it lives, including the food, water and hiding places that enable it to live there.

Inorganic – Materials that **don't** decompose (such as plastics, rocks and metals). Inorganic means "non-living."

Insect – An animal possessing an external skeleton, three body regions, and three pairs of legs.

Interconnected – Joined together so that the movement of one causes the movement of all.

Monitoring – Finding out what, where, and when your pest problem is. Looking regularly and intensively; counting and keeping records.

Molting – The shedding of the insect's skin in metamorphosis.

Natural Resources – Materials or capacities (such as forests, rocks, or water) supplied by nature.

Nymph – The immature form of an insect undergoing gradual metamorphosis.

Organic Wastes – Materials that decompose (such as food, cloth, and paper). Organic means "living".

Pest – An organism that bothers or damages property, pets or humans.

Pesticide – A substance used to control pests. These substances include poisons, pest diseases and repellants.

Recycle – The salvage and reprocessing of used materials (such as paper, metals and glass).

Recyclable – Able to be recycled.

Roach – Nickname for "cockroach".

Roach Trap – A cardboard box coated on the inside with glue, used to monitor for cockroaches. The best traps do not contain poisons.

Urban – Having to do with the city.

Bibliography

The following publications can help impart an understanding of IPM through the exploration of some important IPM components: insects, waste management, environmental systems, and plants and animals. More specific IPM concepts and strategies are contained in the CIAS publications listed in Section IV.

I. Recommended Environmental Books for Children 1

- —on Insects
- —on Recycling
- —on Environmental Systems
- —on Plants and Animals
- —Coloring Books and Games

II. Recommended Background Books for Adults 2

- —on Insects
- —on Pesticide Hazards
- —on Environmental Systems
- —on Plants and Animals

III. Educational Guides and Activities 4
(especially helpful items noted with an *)

- —on Insects
- —on Recycling
- —on Environmental Systems
- —on Plants and Animals
- —Catalogs

IV. Integrated Pest Management Materials from the Center for the Integration of Applied Sciences 8

- —IPM: General Information
- —IPM: Controlling Cockroaches
- —Designing an IPM Program

V. Addresses of Publishers 9

VI. Addresses of State Resource Recovery Agencies (Recycling information) 10

VII. Order Form

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I. Recommended Environmental Books for Children

ON INSECTS:

The Amazing Fact Book of Insects, Casey Horton, A & P Books, 1979
Large sized, brightly colored pictures of insects. Text focuses on the more extraordinary aspects of the various insects.

Pets In a Jar: Collecting and Caring for Small Wild Animals, Seymour Simon, Puffin Books, 1979
A how-to book for would-be pet owners and an on-the-spot observer's guide to small wildlife.

Where Do They Go?: Insects in Winter, Millicent E. Selsam, Scholastic Book Services, 1981
Colorfully illustrated book which answers the question in its title.

ON RECYCLING:

The Laughing Garbage Disposal, Victoria Cox and Stan Applebaum, Western Publishing Co., 1974
Describes the life and role of the hyena with large color pictures. Designed to promote a positive point of view in general and to stimulate an interest among young children in learning more about the world in which they live.

Nature's Smallest Gravedigger, Victoria Cox and Stan Applebaum, Western Publishing Co., 1974
Presents a positive point of view about the beetle. Describes the life and role of the beetle with large color pictures.

The Shopping Bag Lady, Robert Censoni, Holiday House, 1977
Funny story which promotes the value of recycling.

ON ENVIRONMENTAL SYSTEMS:

Nature at Work: Introducing Ecology, British Museum (Natural History), Cambridge Univ. Press, 1978
Introduction to ecological principles; illustrated with excellent graphics.

Nature's Network: The Story of Ecology, Keith Reid, The Natural History Press, 1970
Basics of ecology; presented at junior high school level but easily translated for younger students.

ON PLANTS AND ANIMALS:

Animals: Basic Environment Series Booklet, 4-H Youth Programs, Cooperative Extension Service, Michigan State University
Develops basic environmental concepts as they relate to wildlife, through simple projects.

Baby Animals, Susan Pincus (ed.), Octopus Books Limited, 1974
Excellent photographs of young animals that students can identify with, making "nature" less distant.

Gardening is Easy, Diana Simmons, Marshall Cavendish Publications Ltd., 1974
Leads children step-by-step through planting, growing and maintaining a garden themselves.

How to Raise Mice, Rats, Hamsters, and Gerbils, Sara Bonnet Stein, Random House, Inc., 1976
Teaches children how to befriend and care for domesticated rodents.

The Seed, Ann Cameron, Random House, Inc., 1975
Describes and illustrates plant growth in childlike terms.

The Tremendous Tree Book, May Garelick and Barbara Brenner, Harper & Row, 1979
Encourages the observation of trees with colorful pictures.

Winter Woods, Ada and Frank Graham, Western Publishing Co., 1974
Interests and informs children about the world of nature.

COLORING BOOKS AND GAMES:

The Little Green Thumb Window Garden, Doug Morse, Storyfold, Inc., 1974
A six foot panorama, a planting project and a game board. Also includes a packet of seeds.

Millie and Our Environment, U.S. Environmental Protection Agency Office of Pesticide Programs
Lower elementary level coloring book containing activities that teach basic environmental concepts.

Monarch: A Game Book of Butterflies and Moths, Ruth Wheeler, Naturgraph, 1974
A card game designed to teach players to recognize common butterflies and their families.

A World Fit For Chipmunks & Other Living Things, Danita Ross Haller, U.S. Environmental Protection Agency, U.S. Government Printing Office, 1980
Charlie the chipmunk appreciates his forest home, away from the polluted city park where he used to live.

II. Recommended Background Books For Teachers

ON INSECTS:

Butterflies and Moths, Robert T. Mitchell and Herbert S. Zim, Western Publishing Co., Inc., 1964
An introduction to the more common American butterflies and moths; color illustrations.

How to Know the True Bugs, J.A. Slater and R.M. Baranowski, Wm. C. Brown Company, 1978
Excellent spiral-bound volume meant for beginning students.

Insects, Herbert S. Zim, Ph.D. and Clarence Cottom, Ph.D., Western Publishing Co., Inc., 1956
A guide to familiar American insects; color illustrations.

The Insects, Peter Farb and the editors of LIFE, Time Inc., 1962
Presents the major features of insect natural history. Color photographs and illustrations.

Labelling and Storing an Insect Collection, R. Dirig, 4-H Members Guide, New York State College of Agriculture & Life Sciences

Pamphlet provides a clear description of the how's and why's of labelling and storing an insect collection for anyone who has not had a formal class on the subject.

Twelve Little Housemates, Pergamon Press Inc., 1979

Brief introduction to twelve common household arthropods. Good for the lay person.

The World of Insects, Adriano Zanetti, Abbevill Press, 1978

Stunning introduction to entomology, illustrating the structure, life cycles and economic importance of insects.

ON PESTICIDE HAZARDS:

America the Poisoned: How deadly chemicals are destroying us, our wildlife, our environment and how we can survive, Lewis Regenstein, Acropolis, 1982

The Pesticide Conspiracy, Robert van den Bosch, Anchor Press, Doubleday, 1980

A noted entomologist presents the politics behind the use and abuse of pesticides.

Silent Spring, Rachel Carson, Houghton Mifflin, 1962

One of the first books to discuss environmental degradation caused by pesticides

Since Silent Spring, Frank Graham, Jr., Houghton Mifflin, 1970

Discusses the controversy raised by Carson's book and some avenues open to citizens concerned about pesticides.

ON ENVIRONMENTAL SYSTEMS:

Controversial Chemicals: A Citizens Guide, P. Kruus and I.M. Valeriote (editors), Multiscience Publications, 1979

Created to inform, not to inflame. Written for the general public, teachers and students.

Environmental Conservation, Raymond F. Dasmann, John Wiley & Sons, Inc., 1972

This book looks at our environment and human problems from an ecological viewpoint.

Humanscape: Environments For People, Stephen Kaplan & Rachel Kaplan (ed.), Wadsworth Publishing Company, Inc., 1978

Discusses the uncertain environment in which humans live and views this uncertainty as a problem and a challenge.

The Integral Urban House: Self Reliant Living In the City, Helga Olkowski, Bill Olkowski, Tom Javits and the Farallones Institute Staff, Sierra Club Books, 1979

Shows how to achieve a high quality urban way of life using a fraction of the resources we are accustomed to, at a lower cost, and with less waste, pollution and ugliness.

Interpreting the Environment, Grant W. Sharpe, John Wiley & Sons, Inc., 1976
Offers ideas to the managers,planners, and interpreters of parks, forests, refuges and equivalent areas all over the world.

ON PLANTS AND ANIMALS:

Attracting and Feeding Birds, Thurman W. Booth Jr. and Donald W. Pfitzer, Fish and Wildlife Service, U.S. Dept. of the Interior, 1973
Tells how to make feeders and shelters for birds and gives lists of plants that attract particular species.

Great Lakes Nature Guide, Dr. Paul A. Herbert, Michigan United Conservation Clubs, 1972
Helps identify and describe in words and pictures what is to be found in the Great Lakes area.

Wildlife of the Forests, Ann and Myron Sutton, Harry N. Abrams, Inc., 1979
With brilliant photographs and a text written by naturalists, this book presents the world's forest animals and plant life in their woodland sanctuaries.

III. Educational Guides and Activities

(Especially helpful books noted with *)

ON INSECTS:

Entomology Projects for Elementary and Secondary Schools, John A. Wilcox, University of the State of New York Press, 1972
Consists of an outline and suggestions for a field trip to collect insects, mount specimens and record information and conclusions.

Know the Bug, Ginn and Company, 1976
Introduces the student to insects by use of a mini-course with seventeen activities.

Rearing the Greater Wax Moth, Information Division Agricultural Research Service, Government Printing Office, 1970
Studies complete metamorphosis as shown by the life cycle of the greater wax moth. For elementary and secondary school students.

ON RECYCLING:

Let's Recycle!, U.S. Environmental Protection Agency, 1980
Lesson plans for grades K-12.

Recycling, Ranger Rick's Magazine, National Wildlife Federation, 1980
Educational reprint.

ON ENVIRONMENTAL SYSTEMS:

***Connections: A Curriculum in Appropriate Technology for Fifth and Sixth Grades,** Joan Melcher, National Center for Appropriate Technology, 1980
Very well-organized collection of environmental activities. Clear and concise format. Good background preparation for each lesson.

***Differences in Living Things: An Environmental Investigation,** Minnesota Environmental Science Foundation, Inc., National Wildlife Federation, 1971
Illustrates some of the variations that exist within species of the plant kingdom. The conclusions drawn and the concepts developed can be extended to the animal kingdom as well. Grade level 4-8.

Ekistics, California State Dept. of Education, Office of State Printing, 1973
A guide for the development of an interdisciplinary environmental education curriculum.

***Energy Education Instructional Materials Sampler,** Energy and Man's Environment, 1980
Kindergarten through grade 12

Environmental Conservation Program Design, Dr. R.W. George, Fisheries and Wildlife Department, Michigan State University, 1976
Assists the teacher in developing "basic" concepts of environmental conservation and in designing a program curriculum. Grade levels K-12.

***Environmental Education Activities Manual: Volumes 1-6,** William B. Stapp and Dorothy A. Cox (ed.), Stapp and Cox Publishers, 1975
Provides valuable resources to teachers and curriculum specialists in constructing a viable environmental education program for their students. Contains actual activities for the classroom, contributed by students, teachers and community members.

***The Everything Including the Kitchen Sink Guide to Environmental Education,** Northern California Facilitator Project, 1979
Addresses a wide range of outdoor environmental study; most of the lessons are targeted for specific age groups.

Examining Your Environment Series, Mine Publications, Inc.
A series of paperback texts covering many aspects of the environment in depth. Grade levels 4-6.

Exploring Nature's Classroom, James A. Miller and Don Hollums, Michigan Environmental Education Association
A series of experience-oriented educational activities; primarily interdisciplinary and non-graded. Provides a background for understanding natural systems.

***Man's Habitat—The City: An Environmental Investigation Into the Urban Ecosystem,** Minnesota Environmental Sciences Foundation, Inc., National Wildlife Federation, 1971

Provides the city child with a chance to understand ecology without ignoring the apparent influence of man. The suggested activities involve the students with the study of their own immediate environment. Grade levels 4-9.

My Weekly Reader Practice Book: Ecology and Focus on Pollution, American Education Publications

Ecology—Grade levels 4-6, Focus on Pollution—Grade levels 1-6.

***Oaks, Acorns, Climate and Squirrels: An Environmental Investigation Into Elements of a Natural Cycle,** Minnesota Environmental Sciences Foundation, Inc., National Wildlife Federation, 1972

Leads to an understanding of some of the relationships of oak trees to acorns to squirrels to grubs to climate. Grade levels 1-6.

***Populations,** Educational reprint from Ranger Rick's Nature Magazine, National Wildlife Federation, April 1973

***A Program of Outdoor Activities,** Outdoor Biology Instructional Strategies, Delta Education, Inc.

Offers opportunities to investigate ecological relationships in their local environment. Activities designed for ten to fifteen year-olds.

***Sampling Button Populations: An Environmental Investigation Into Statistics in the Classroom,** Minnesota Environmental Sciences Foundation, Inc., National Wildlife Federation, 1972

Helps provide an understanding of what sampling and sampling procedures are all about. Grade levels 3-9.

Science Mysteries Through Puzzles, Games and Individual Activities, Ray Broekel, Hayes School Publishing Co., Inc., 1977

Contains activities, puzzles and charts to be used in science at the first and second grade levels. Many can also be used in classroom situations other than science.

***Sharing Nature With Children,** Joseph Bharat Cornell, Ananada Publications, 1979

Presents forty-two games which create a situation or an experience in which nature is the teacher. For children and adults.

***Snow and Ice: An Environmental Investigation,** Minnesota Environmental Science Foundation, Inc., National Wildlife Federation, 1971

Presents many physical properties related to water and freezing. Grade levels 1-6.

Using the School and Community as Environmental Study Areas, Nashville Metro Schools

Teacher's guide and student activities. Grade levels K-6.

***Water—What Would We Do Without It?,** Ranger Rick's Nature Magazine, National Wildlife Federation, 1978

Educational reprint.

***Wind: An Environmental Investigation,** Minnesota Environmental Sciences Foundation, Inc., National Wildlife Federation, 1971
Leads to an understanding of the wind. Grade levels 3-6.

The World Around You: Environmental Education Packet, The Garden Club of America
Gives a comprehensive overview and background on various environmental subjects.

ON PLANTS AND ANIMALS:

Birdwatching with Roger Tory Peterson, Ranger Rick's Nature Magazine, National Wildlife Federation, 1973
Educational reprint.

Farming in the Classroom: Teacher's Guide, Agricultural Research Service, U.S. Dept. of Agriculture, Government Printing Office, 1973
Introduces children to farm animals and explains how these animals are useful to them. Includes a teacher's guide, activities, workbook and coloring book.

Growth of a Tree, American Forest Institute, 1980
Investigates the growth of a tree through science and language arts activities.

Plants: Instructor Primary Science Discovery Series, The Instructor Publications, Inc.
Poster series involving students in learning about plants through a "hands-on" approach.

Plants in the Classroom: An Environmental Investigation, Minnesota Environmental Sciences Foundation, Inc., National Wildlife Federation, 1971
Introduces ecology to children by investigating the interrelationship between a plant and its needs.

***Project Learning Tree,** American Forest Institute, Inc., 1977
Engages students in interdisciplinary exploration of nature, using concepts underlying the major academic disciplines. Grade levels K-6.

CATALOGS:

Directory of Environmental Education Resources, Sharee Morris, Center for Environmental Education, 1980
A guide to national and international organizations that provide information on the environment.

Environmental Education, Lee County Schools Environmental Education Center
Listing of guides and booklets on the subject of environmental education.

IV. IPM Materials from the Center for the Integration of Applied Sciences (CIAS), a division of the John Muir Institute

IPM: GENERAL INFORMATION:

#1 **Summary of Pest Control Methods**

#53 **Understanding Integrated Pest Management**

#56 **Pest Control Strategies: Urban Integrated Pest Management**

#74 **Ecosystem Management: A Framework for Urban Pest Control**

#75 **Entomophobia in the Urban Ecosystem**

#78 **Options in Pest Management**

#84 **Some Advantages of Urban Integrated Pest Management Programs and Barriers to Their Adoption**

IPM: CONTROLLING COCKROACHES:

#13 **"Do You Love Cockroaches?"**

#21 Reprints of the Urban Ecosystem Management Column from the **IPM Practitioner** newsletter: the Newsletter of Integrated Pest Management, 1980
Cockroach Management
What is IPM?

#22 Reprints of the Urban Ecosystem Management column from the **IPM Practitioner** newsletter: the Newsletter of Integrated Pest Management, 1981
An IPM Program for Roaches in Public Housing
Contract Specifications: The Weak Link in the Transition to Cockroach IPM

DESIGNING AN IPM PROGRAM:

#59 **Urban Integrated Pest Management in California: An Assessment and Action Plan**

#73 **Directions for Appropriate Ecological Habitat Redesigns**

#77 **A Model Ecosystem Management Program**

#81 **Developing an Integrated Pest Management Program for a School District**

#82 **Developing Urban IPM Delivery Systems**

#83 **Making the Transition to an Urban IPM Program**

#85 **A Systematic Approach for Making the Transition to IPM**

(CIAS Order Form attached)

V. Addresses of Publishers

Abbevill Press
505 Park Ave.
New York, NY 10022

American Educational Publications
Education Center
Columbus, OH 43216

The American Forest Institute, Inc.
1619 Massachusetts Ave., N.W.
Washington, D.C. 20036

California State Dept. of Education
721 Capitol Mall
Sacramento, CA 95814

Center for Environmental Education
1925 K Street N.W. Suite 206
Washington, D.C. 20006

Center for the Integration of Applied Sciences
1010 Grayson Street
Berkeley, CA 94710

Delta Education
Box M
Nashua, NH 03061

Energy & Man's Environment
7874 S.W. Nimbus Ave.
Beaverton, OR 97005

The Garden Club of America
598 Madison Avenue
New York, NY 10022

Ginn & Company
Lexington, MA 02173

Hayes School Publishing Company, Inc.
Wilkinsburg, PA

The Instructor Publications, Inc.
Dansville, NY 14437

Lee County Schools
Environmental Education Center
2055 Central Avenue
Fort Myers, FL 33901
Attn. Rosemarie Hammond

Michigan Environmental Education
Association Publications
238 N. Creyts Rd.
Lansing, MI 48917

Michigan State University Printing
East Lansing, MI 48824

Mine Publications, Inc.
25 Groveland Terrace
Minneapolis, MN 55403

Multiscience Publications
1253 McGill College, Suite 175
Montreal, Quebec, Canada H3B 2Y5

Nashville Metro Schools
Environmental Education Department
Nashville, TN 37202

National Center for Appropriate Technology
Box 3838
Butte, MT 59701

National Wildlife Federation
1412 Sixteenth Street N.W.
Washington, D.C. 20036

New York State College of Agriculture
& Life Sciences
Mailing Room, Building 7
Research Park, Cornell University
Ithaca, NY 14853

Northern California State Facilitator
Butte County Superintendent of Schools
5A County Center Drive
Oroville, CA 95965

Pergamon Press Inc.
Maxwell House, Fairview Park
Elmsford, NY 10523

Stapp & Cox
30308 LaMar
Farmington Hills, MI 48024

VI. Addresses of State Resource Recovery Agencies (Recycling Information)

Alabama: Planning & Resource Recovery Section, Div. of Solid & Hazardous Waste, Dept. of Public Health, State Off. Bldg., Montgomery, AL 36130

Alaska: Air & Solid Waste, Dept. of Environmental Conservation, Pouch O, Juneau, AK 99811

Arizona: Bur. of Waste Control, Dept. of Health Services, 1740 West Adams St., Phoenix, AZ 85007

Arkansas: Dept. of Pollution Control & Ecology, P.O. Box 9583, 8001 Nat'l Dr., Little Rock, AR 72219

California: Resource Conservation & Development Div., Solid Waste Management Bd., 1020 Ninth St., Suite 300, Sacramento, CA 95814

Colorado: Dept. of Health, 4210 E. Eleventh Ave., Denver, CO 80220

Connecticut: Solid Waste Management Unit, Dept. of Environmental Protection, State Office Bldg., 165 Capitol Ave., Hartford, CT 06115

Delaware: Solid Waste Management, Dept. of Nat. Res. & Environmental Control, Edward Tatnall Bldg., P.O. Box 1401, Dover, DE 19901

District of Columbia: Dept. of Envir. Serv., 5000 Overlook Ave., S.W., Washington, D.C.20032

Florida: Resource Recovery Subsection, Solid Waste Management Section, Dept. of Environmental Regulation, 2600 Blair Stone Road, Tallahassee, FL 32301

Georgia: Planning & Resource Conservation Unit, Environmental Protection Div., Dept. of Nat. Res., 3420 Norman Berry Dr., 7th Floor, Scott Hudgens Bldg., Hapeville, GA 30354

Hawaii: Pollution Tech. Review Branch, Dept. of Health, P.O. Box 3378, Honolulu, HI 96801

Idaho: Solid/Hazardous Materials Sect., Dept. of Health & Welfare, State House, Boise, ID 83720

Illinois: Div. of Land & Noise Pollution Control, Environmental Protection Agency, 2200 Churchill Rd., Rm. A 104, Springfield, IL 62706

Indiana: Solid Waste Mgmnt. Sect., State Bd. of Health, 1330 W. Michigan St., Indianapolis, IN 46206

Iowa: Air & Land Quality Div., Dept. of Environmental Quality, Henry A. Wallace Bldg., 900 East Grand St., Des Moines, IA 50319

Kansas: Solid Waste Management Sect., Dept. of Health & Environment, Topeka, KS 66620

Kentucky: Div. of Waste Management , Dept. of Nat. Resources & Environmental Protection, Pine Hill Plaza, 1121 Louisville Rd., Frankfort, KY 40601

Louisiana: Dept. of Natural Res., P.O. Box 44396, Baton Rouge, LA 70804

Maine: Bureau of Land Quality Control, Dept. of Envir. Protection, State House – Station 17, Augusta, ME 04333

Maryland: Maryland Environmental Service, Dept. of Nat. Res., 60 West St., Annapolis, MD 21401

Massachusetts: Bureau of Solid Waste Disposal, Dept. of Environmental Mgmt., 1905 Leverett Saltonstall Bldg., 100 Cambridge St., Boston, MA 02202

Michigan: Resource Recovery Division, Dept. of Nat. Res., Westland Plaza, Lansing, MI 48909

Minnesota: Div. of Solid Waste Mgmt., Poll. Cont. Agency, 1935 W. County Rd. B-2, Roseville, MN 55106

Mississippi: Div./Solid Waste Mgmt. & Vector Control, State Bd. of Health, P.O. Box 1770, Jackson, MS 39205

Missouri: Solid Waste Mgmt. Prog., Dept. of Nat. Res., P.O. Box 1368, 1915 Southride Dr., Jefferson City, MO 65102

Montana: Solid Waste Mgmt. Bur., Dept. of Health & Envir. Sci., Rm. A201, Cogswell Bldg., Helena, MT 59620

Nebraska: Litter Reduction & Recycling Prog., Box 94877, Statehouse Sta., Lincoln, NB 68509

Nevada: Waste Mgmt. Prog. Div., Dept. of Conserv. & Nat. Res., Cap. Comp., Carson City, NV 89701

New Hampshire: Governors Council on Energy, 2½ Beacon St., Concord, NH 03301

New Jersey: Office of Recycling, Dept. of Energy and Environmental Protection, 101 Commerce St., Newark, NJ 07102

New York: Div. of Solid Waste, Dept. of Envir. Conserv., 50 Wolf Rd., Albany, NY 12233

North Carolina: Solid/Hazardous Waste Mgmt. Branch, Dept. of Human Res., P.O. Box 2091, Raleigh, NC 27602

North Dakota: Resource and Recovery Branch, Div. Environmental Waste Mgmt. & Research, Dept. of Health, 1200 Missouri Ave., 3rd Fl., Bismarck, ND 58505

Ohio: Office of Litter Control, Fountain Sq., Columbus, OH 43224

Oklahoma: Industrial & Solid Waste Serv., Dept. of Health, P.O. Box 53551, 1000 N.E. 10th St., Oklahoma City, OK 73152

Oregon: Recycling, Dept. of Envir. Qual., P.O. Box 17860, 522 S.W. 5th Ave., Portland, OR 97204

Pennsylvania: Res. Recovery Sect., Bur. of Solid Waste Mgmt., Dept. of Envir. Resources, Fulton Bldg., P.O. Box 2063, Harrisburg, PA 17120

Rhode Island: Solid Waste Mgmt. Prog., Dept. of Envir. Mgmt., 204 Cannon Bldg., 75 Davis St., Providence, RI 02908

South Carolina: Solid Waste Mgmt. Div., Dept. of Health & Environmental Control, J. Marion Sims Bldg., 2600 Bull St. Columbia, SC 29201

South Dakota: Office of Energy Policy, Capitol Lake Plaza, Pierre, SD 57501

Tennessee: Div. of Solid Waste Mgmt., Dept of Pub. Health, 150 Ninth Ave. N., Nashville, TN 37203

Texas: Solid Waste Sect., Dept. of Water Res., 1700 N. Congress Ave., P.O. Box 13087, Capitol Sta., Austin, TX 78711

Utah: Bureau of Solid Waste Mgmt., Div. of Environmental Health, Dept. of Health, P.O. Box 2500, 150 North Temple, Salt Lake City, UT 84110

Vermont: Air & Solid Waste Programs, Agency of Environmental Conservation, State Office Bldg., Montpelier, VT 05602

Virginia: Div. Solid & Hazard. Waste Mgmt., Dept. of Health, 109 Governor St., Richmond, VA 23219

Washington: Solid Waste Mgmt. Div., Dept. of Ecology, Olympia, WA 98504

West Virginia: Solid Waste Div., Dept. of Health, 1800 Washington St. E., Charleston, WV 25311

Wisconsin: Solid Waste Recycling Authority, 3321 W. Beltline Hwy., Madison, WI 53713

Wyoming: Solid Waste Mgmt. Prog., Dept. of Environmental Quality, Equality State Bank Bldg., 401 W. 19th St., Rm. 3011, Cheyenne, WY 82002

Order Form

Name ______________________________ Date __________

Address ______________________________

____

Cockroach Clean-Up Tour Materials:

Quantity	Item	Cost	Total
________	"My Very Own. . ." Take-Home Booklet		________
________	Filmstrip and sound tape cassette (8 min., color)		________
________	Complete Poster Tour		________
________	Additional Basic Modules		________

IPM Materials from the Center for the Integration of Applied Sciences, division of JMI:

Pub. #	Quantity	Cost	Total
1	________	1.00	________
13	________	1.00	________
21	________	3.00	________
22	________	2.50	________
53	________	1.75	________
56	________	2.50	________
59	________	5.00	________
73	________	2.50	________
74	________	1.00	________
75	________	1.00	________
77	________	1.25	________
78	________	2.75	________
81	________	1.25	________
82	________	2.00	________
83	________	1.00	________
84	________	1.00	________
85	________	1.75	________

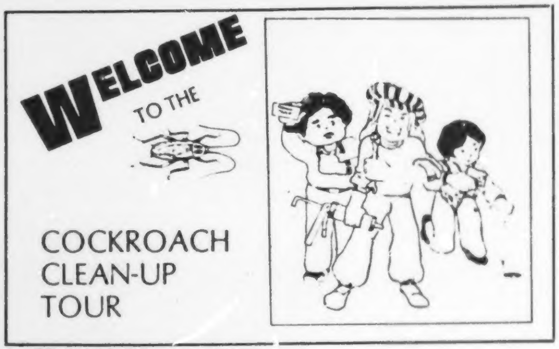
Sales Tax, CA Residents Only	________
Postage and Handling Costs (15% of subtotal)	________
Option $1.00 Special Handling Charge (for quicker delivery)	________
TOTAL ENCLOSED	________

Payment must accompany order.
Send no cash or stamps.
Make check or money order to:
John Muir Institute: IPM

Mail order and remittance to:
John Muir Institute
743 Wilson Street
Napa, California 94558

THE COCKROACH CLEAN-UP TOUR

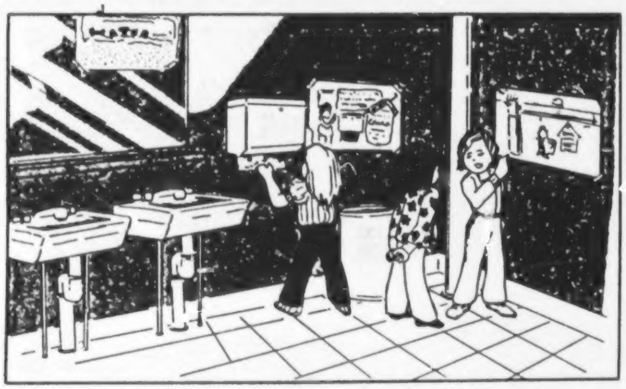
Guided Walk Poster Series

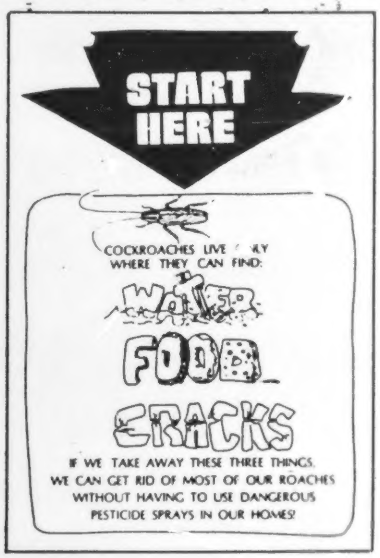

WELCOME
TO THE
COCKROACH
CLEAN-UP
TOUR

ACTUAL POSTER 11" x 17"

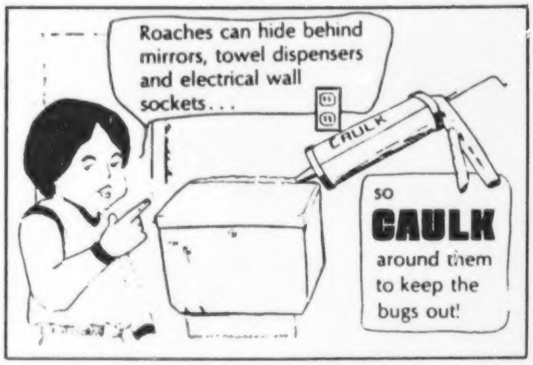
You can obtain a set of Guided Walk Posters by using the order form located at the back of this packet. The set of sixteen colorful 11" x 17" posters has been developed to supplement the Cockroach Module's Lessons and Take-Home Booklet.

Since most real-life roach management takes place in warm, moist areas, we suggest that the posters be temporarily affixed to the walls of a bathroom in the school for viewing. (If this is impractical, the walls of any classroom or corridor can be used to display the posters.)

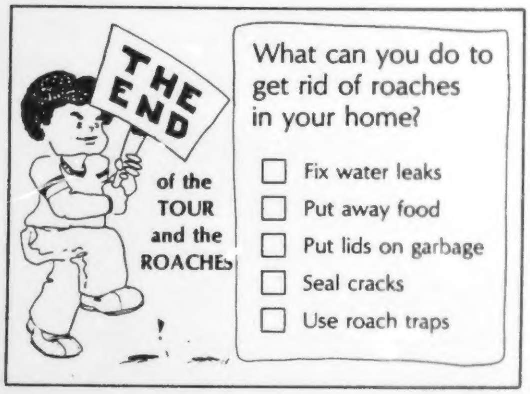



START
HERE
COCKROACHES LIVE ONLY WHERE THEY CAN FIND:
WATER
FOOD
CRACKS
IF WE TAKE AWAY THESE THREE THINGS, WE CAN GET RID OF MOST OF OUR ROACHES WITHOUT HAVING TO USE DANGEROUS PESTICIDE SPRAYS IN OUR HOMES!

The poster Tour has been designed to lead students step-by-step through the basics of cockroach management. Environmental considerations are stressed . . .


Roaches can hide behind mirrors, towel dispensers and electrical wall sockets . . .
CAULK
so
CAULK
around them to keep the bugs out!

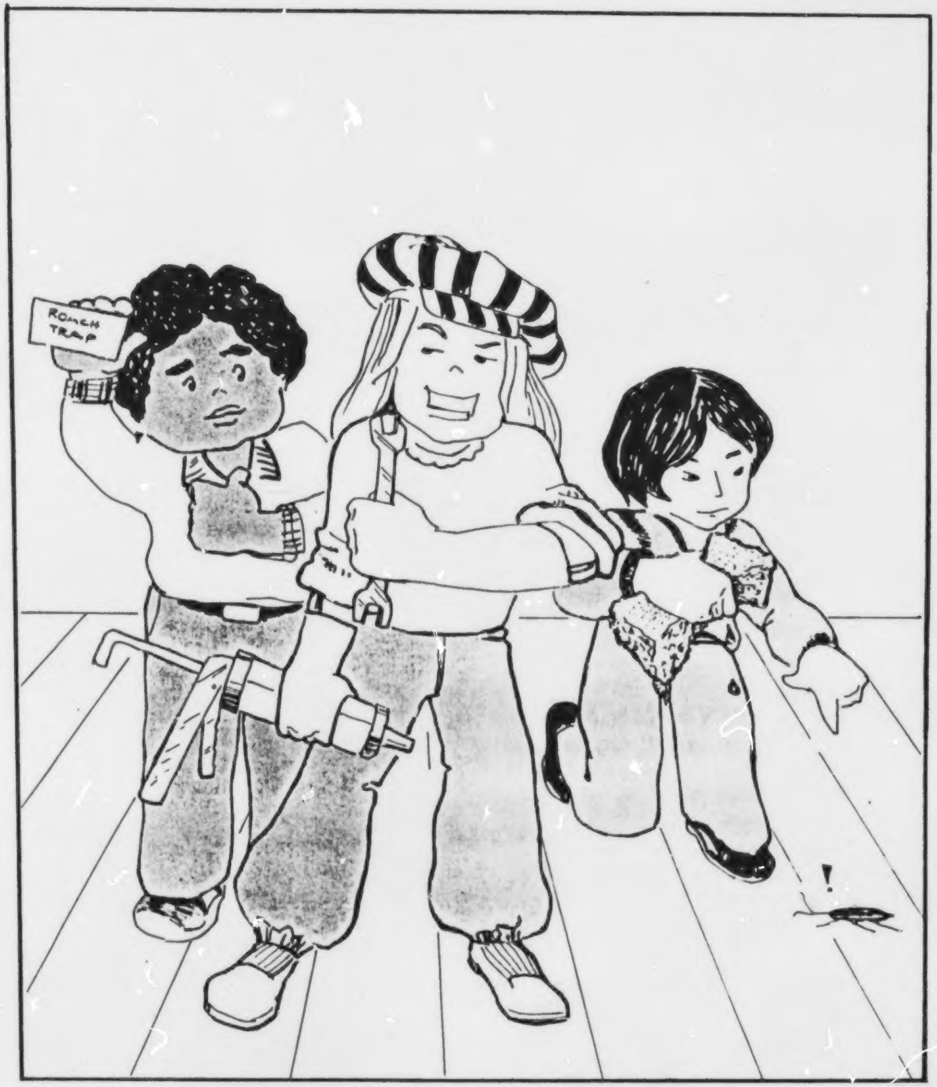
. . . along with more specific roach management instructions.


THE END
of the TOUR and the ROACHES
What can you do to get rid of roaches in your home?
☐ Fix water leaks
☐ Put away food
☐ Put lids on garbage
☐ Seal cracks
☐ Use roach traps

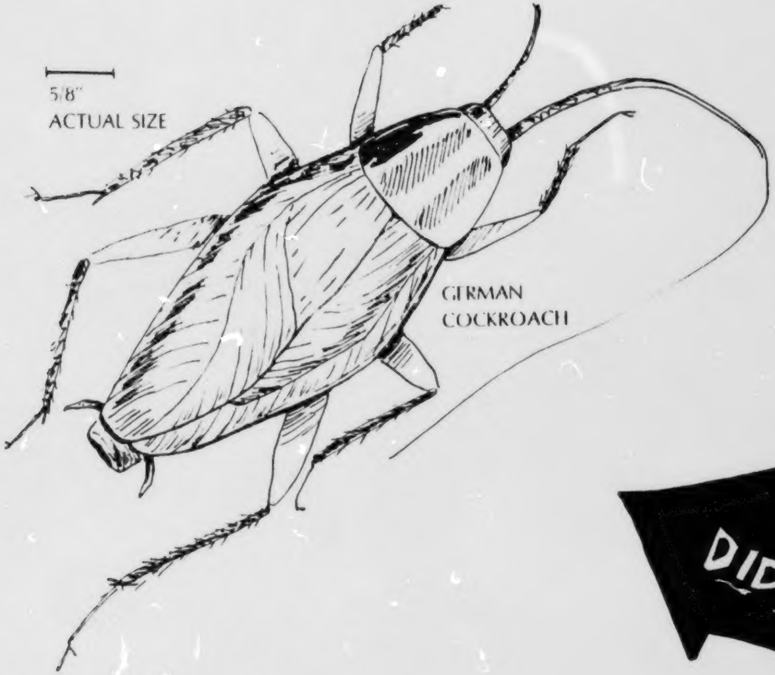
Students of all ages will find it easy to identify with the characters on the posters, as material presented in the classroom lessons is visually reinforced.

WELCOME TO THE

COCKROACH CLEAN-UP TOUR



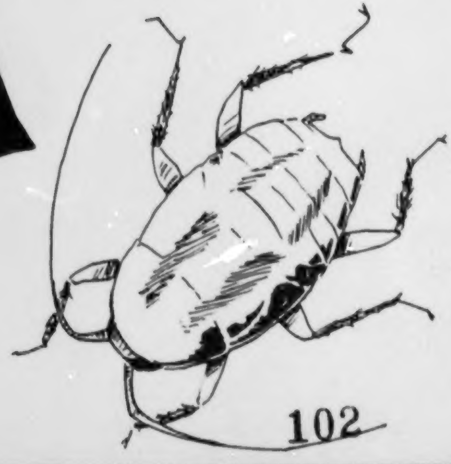
Have You Ever Seen Fast-Moving Little Bugs Running Around In This Room?


5/8"
ACTUAL SIZE
GERMAN
COCKROACH

DID THEY LOOK LIKE THIS?

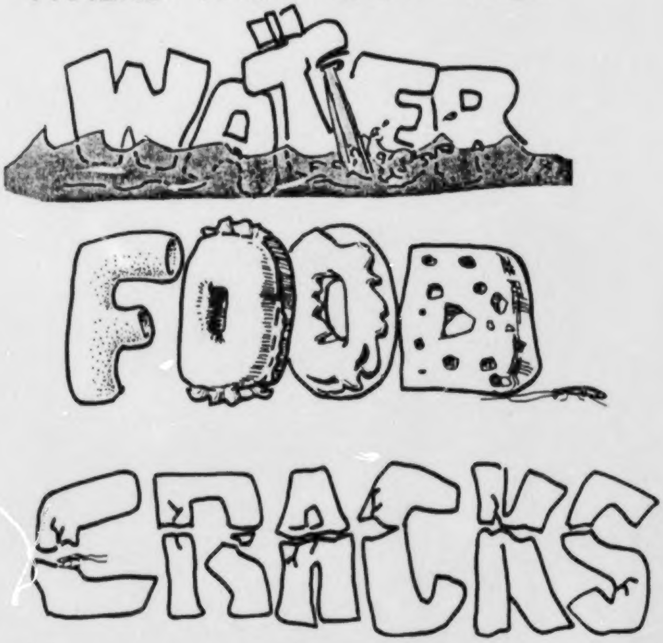
YES? Then this room is a place where cockroaches are happy to call "home".

NO? It might be because this isn't a place where cockroaches like to live.



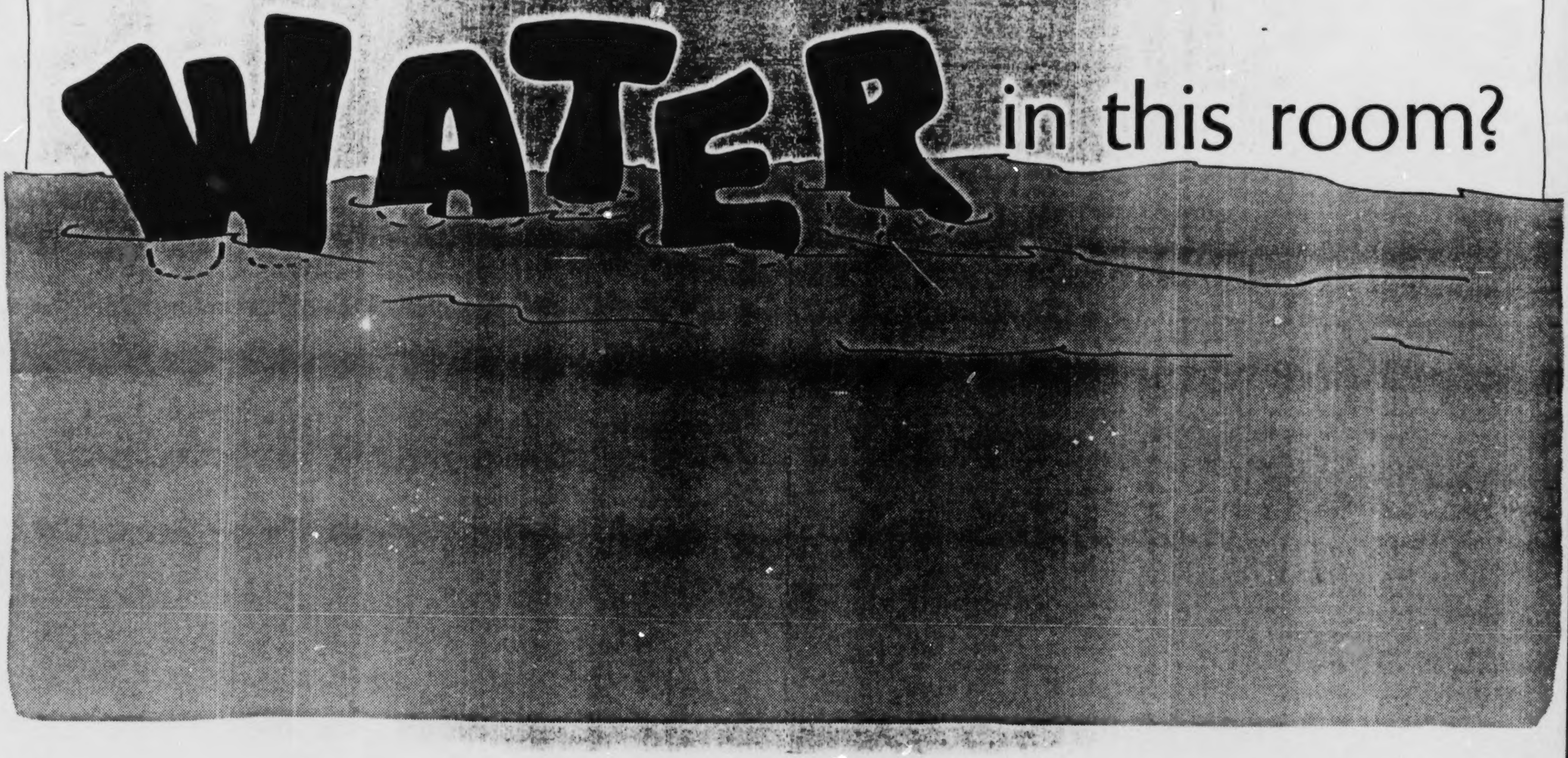
START HERE

COCKROACHES LIVE ONLY
WHERE THEY CAN FIND:

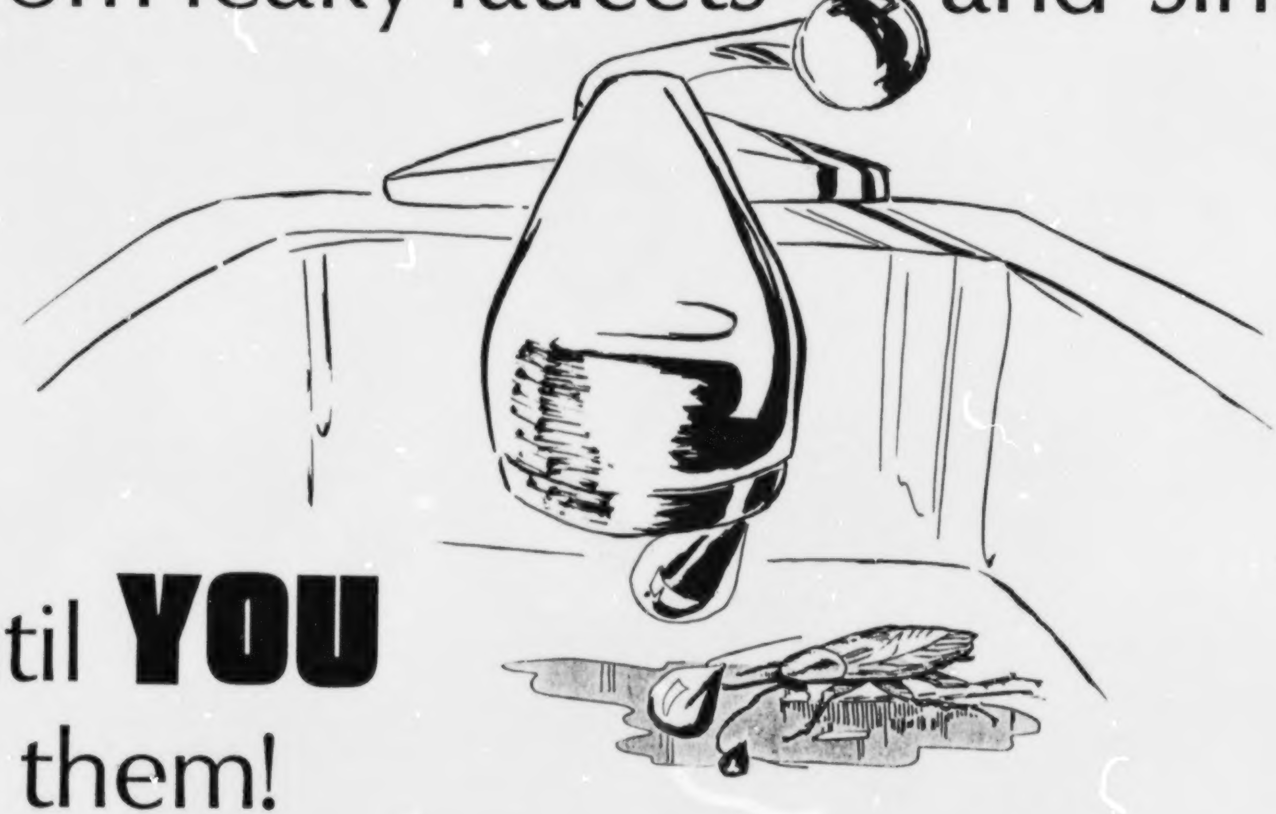


IF WE TAKE AWAY THESE THREE THINGS,
WE CAN GET RID OF MOST OF OUR ROACHES
WITHOUT HAVING TO USE DANGEROUS
PESTICIDE SPRAYS IN OUR HOMES!

Where do you think cockroaches could find WATER in this room?

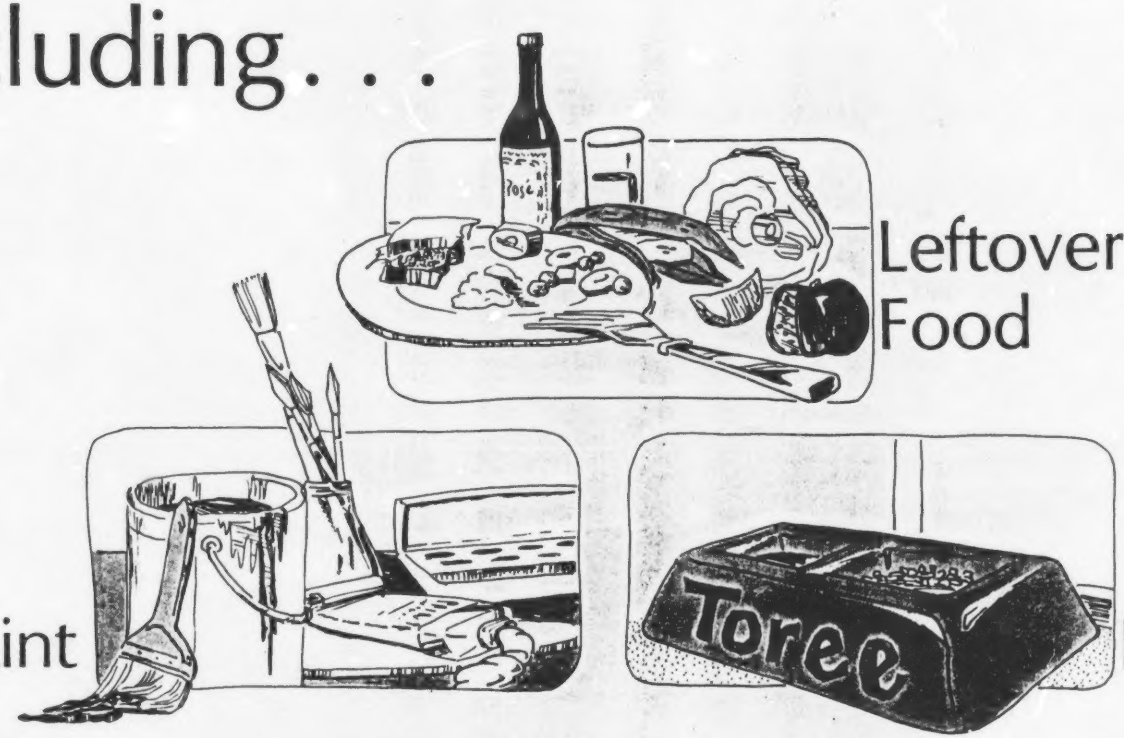


Roaches can easily get water from leaky faucets and sinks

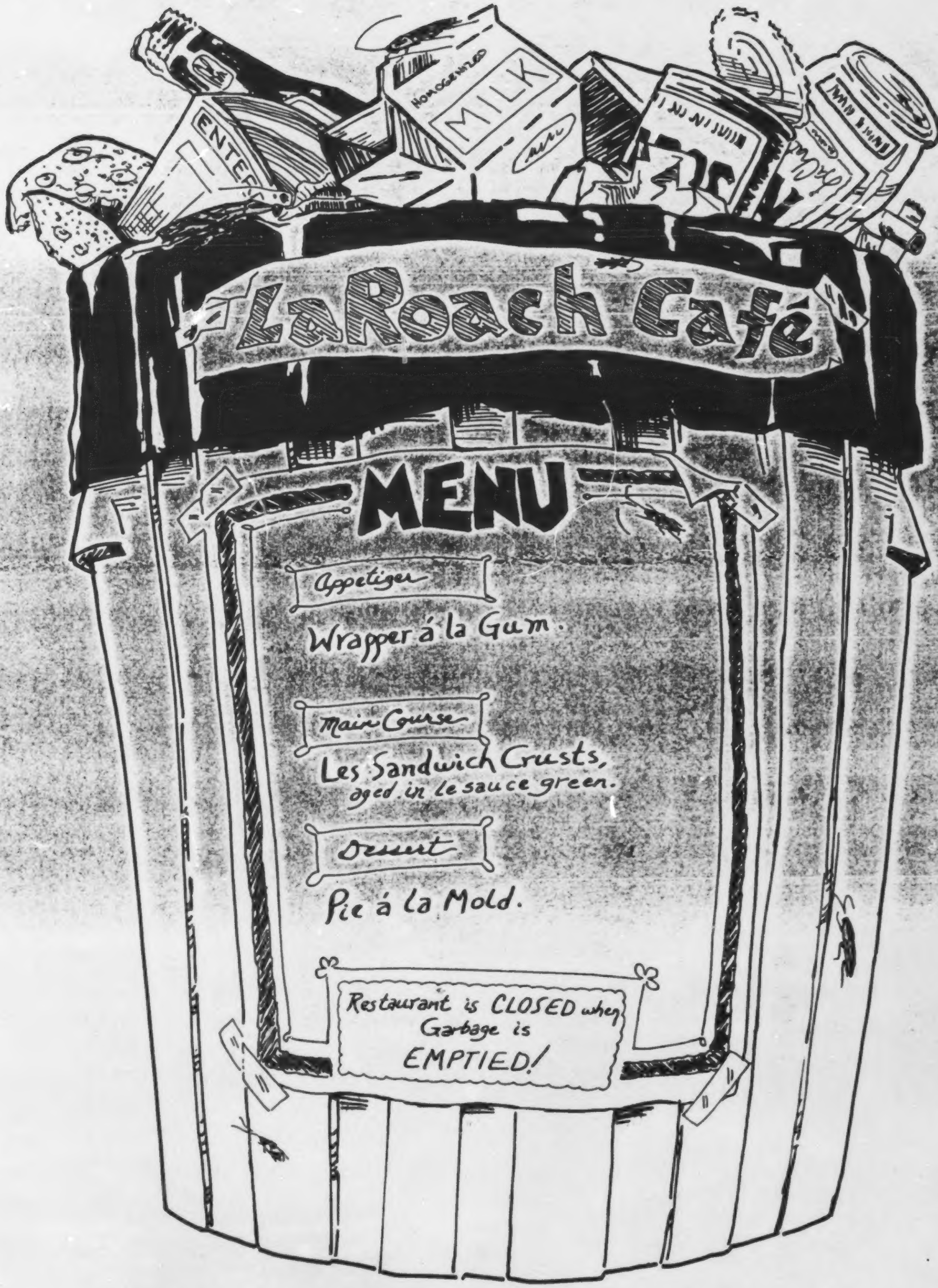


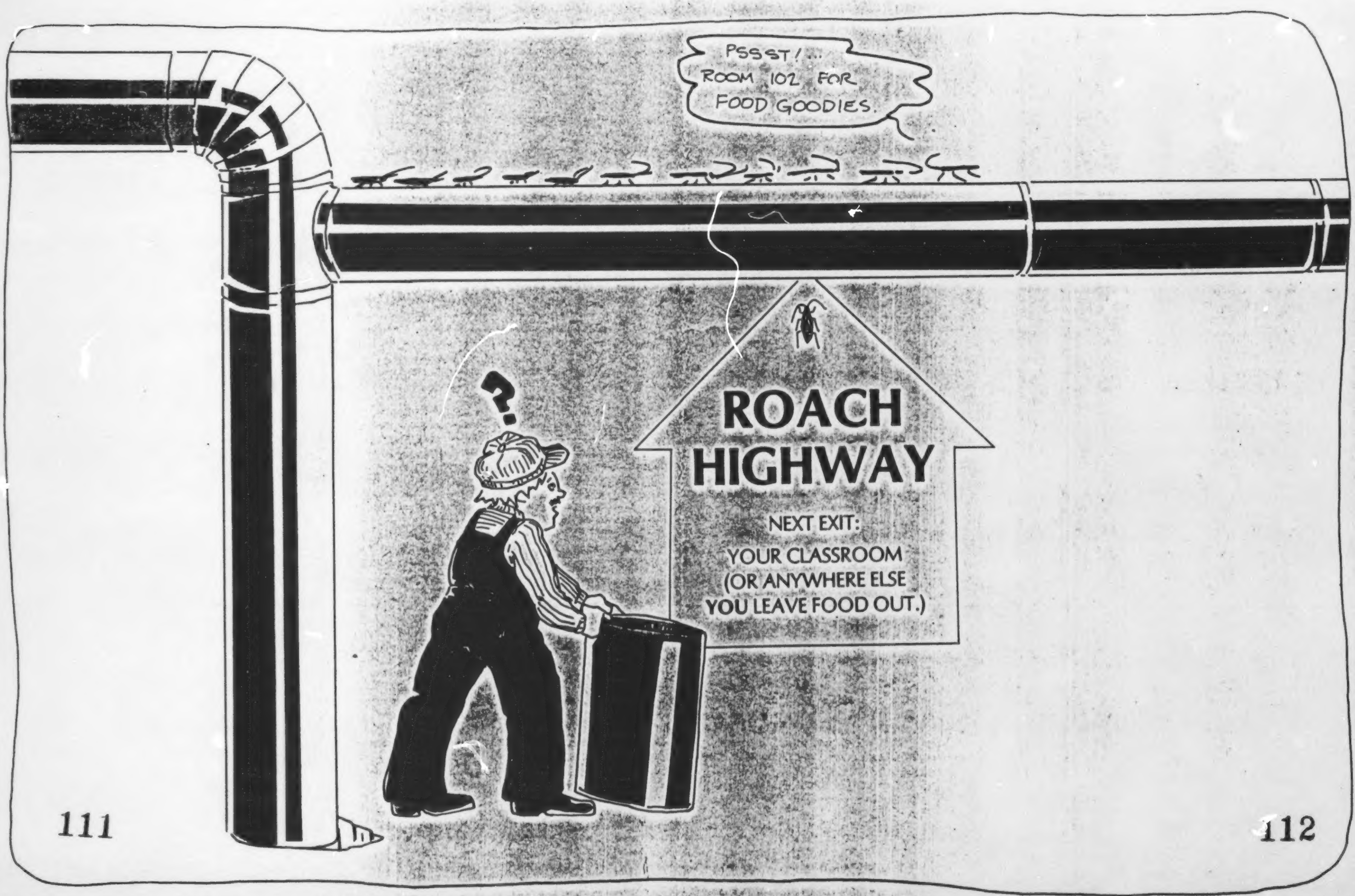
until **YOU** fix them!

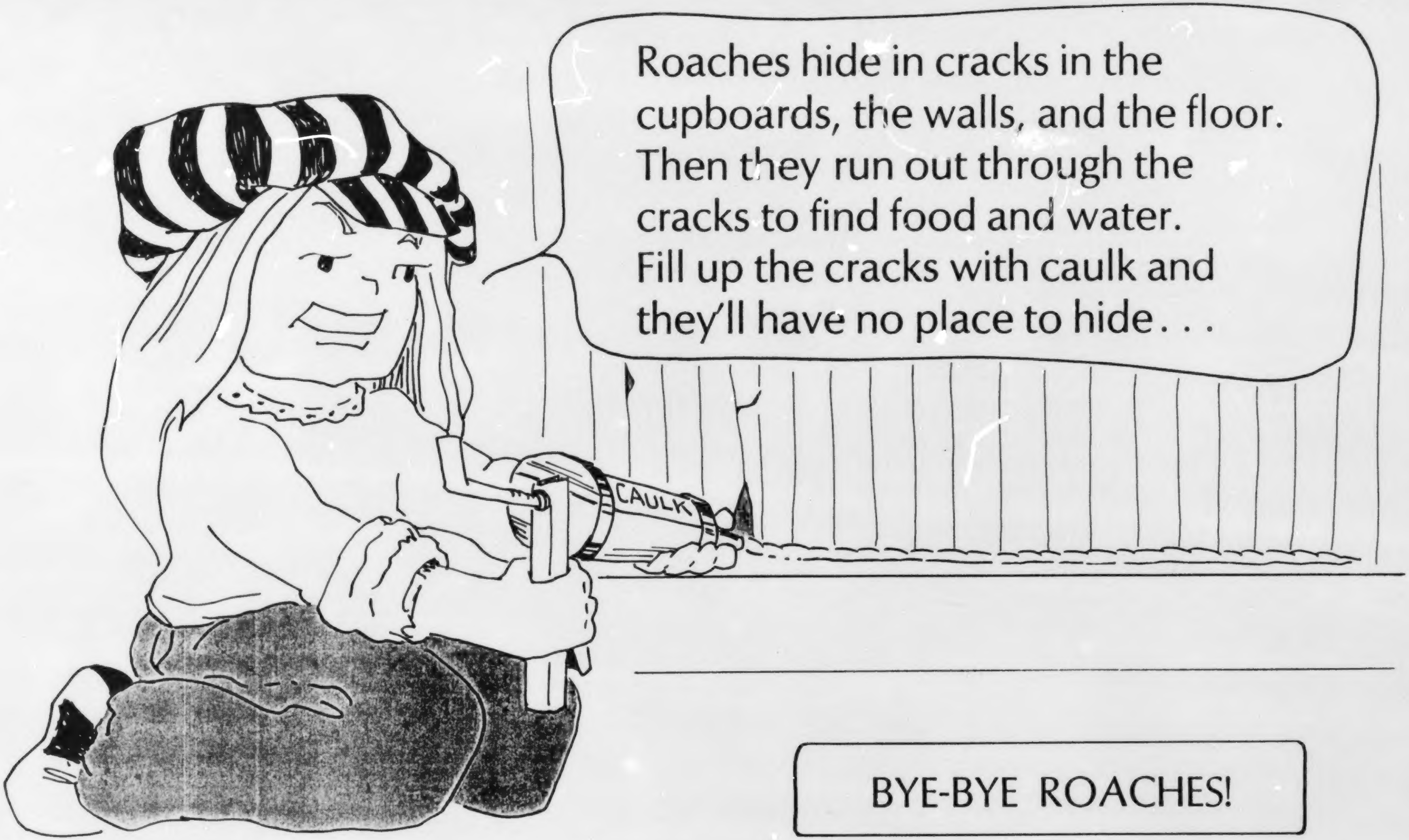
Cockroaches eat lots of things including. . .


Rosé
Leftover Food
Paint
Toree
Pet Food

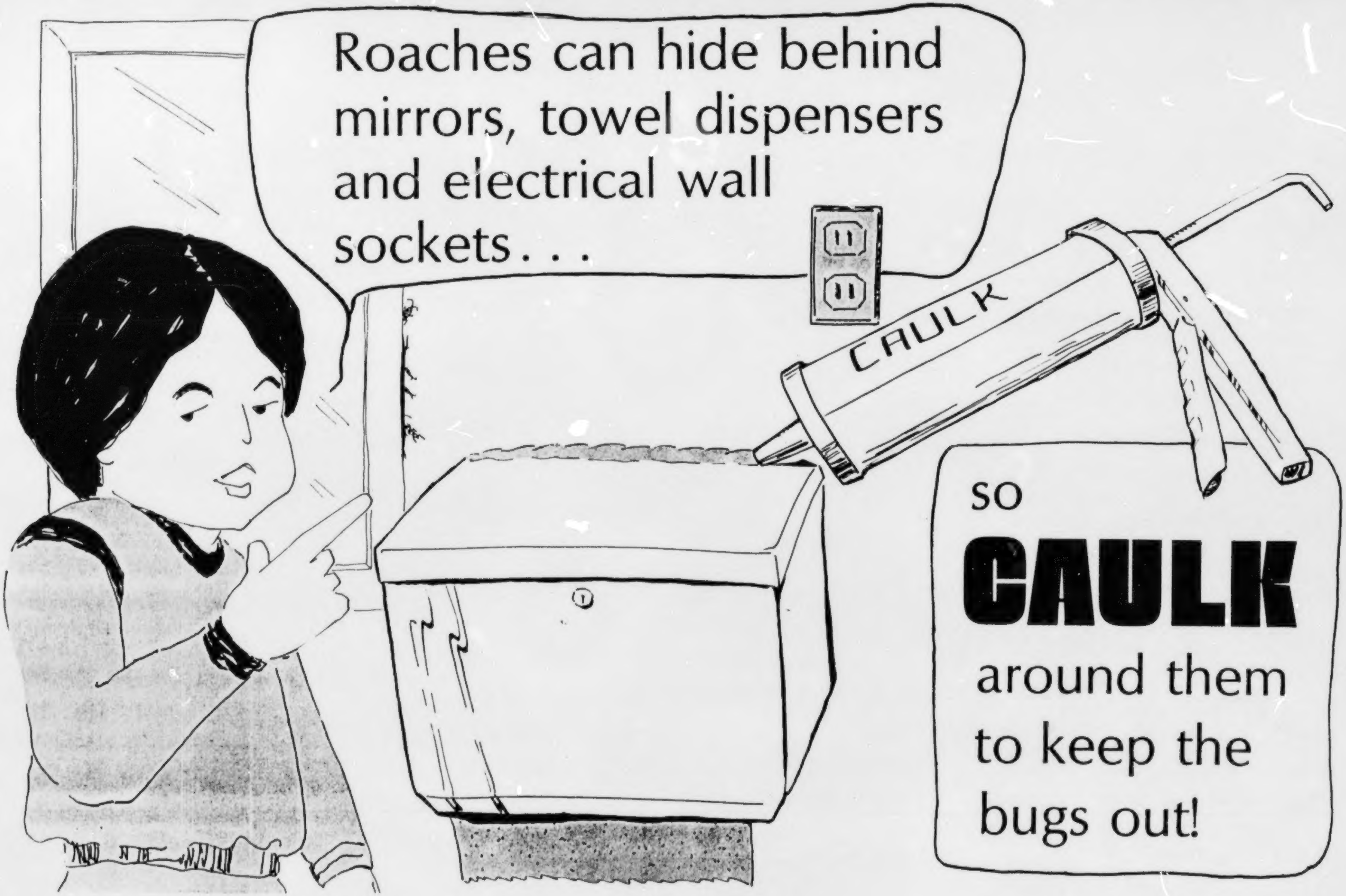
What **FOOD** could they find in this room?


HOMOGENIZED
MILK
ENTER
LaRoach Café
MENU
Appetizer
Wrapper á la Gum.
Main Course
Les Sandwich Crusts,
aged in le sauce green.
Dessert
Pie á la Mold.
Restaurant is CLOSED when Garbage is EMPTIED!

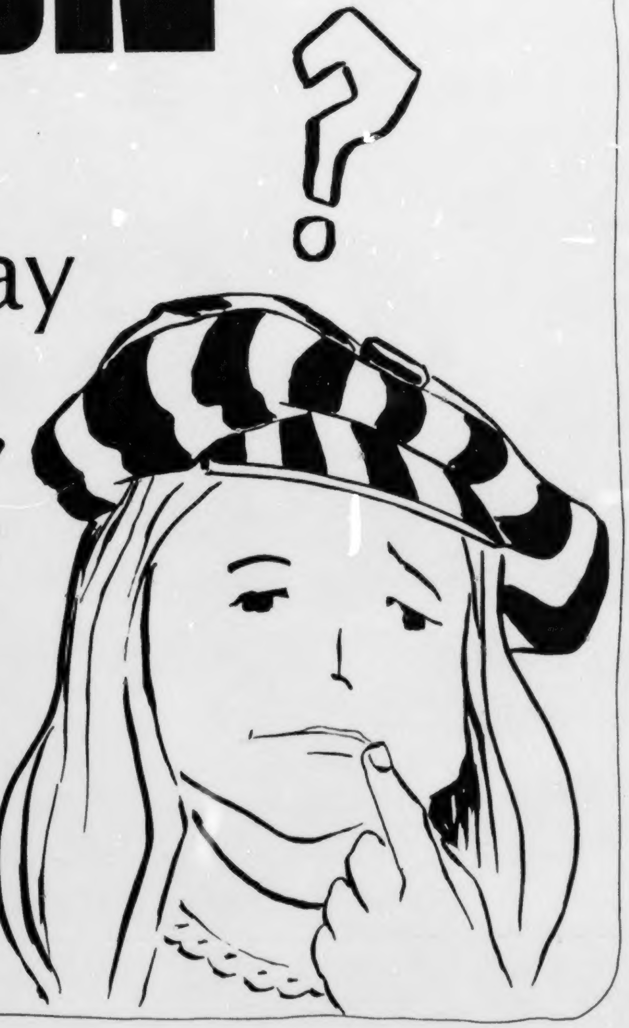

PSSST!... ROOM 102 FOR FOOD GOODIES.
?
ROACH HIGHWAY
NEXT EXIT:
YOUR CLASSROOM
(OR ANYWHERE ELSE
YOU LEAVE FOOD OUT.)


Roaches hide in cracks in the cupboards, the walls, and the floor. Then they run out through the cracks to find food and water. Fill up the cracks with caulk and they'll have no place to hide . . .
CAULK

BYE-BYE ROACHES!

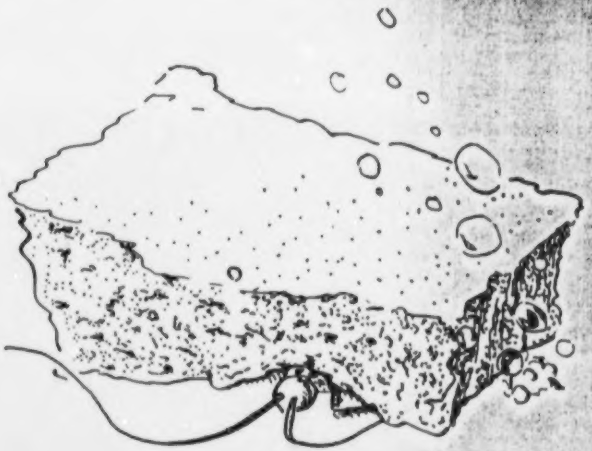

Roaches can hide behind mirrors, towel dispensers and electrical wall sockets. . .
CAULK
so CAULK around them to keep the bugs out!

QUESTION



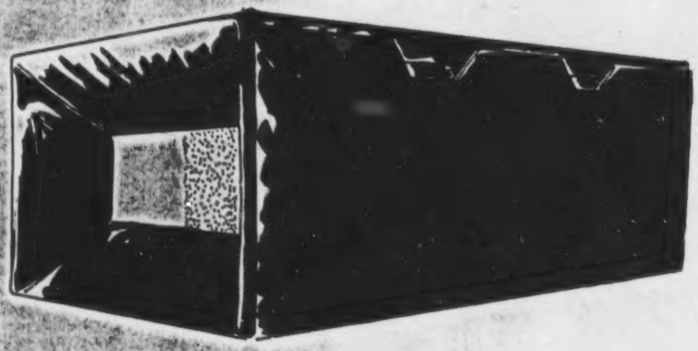
Once you've taken away their **FOOD** and **HOMES**, how do you get rid of hungry, homeless roaches?

ANSWER

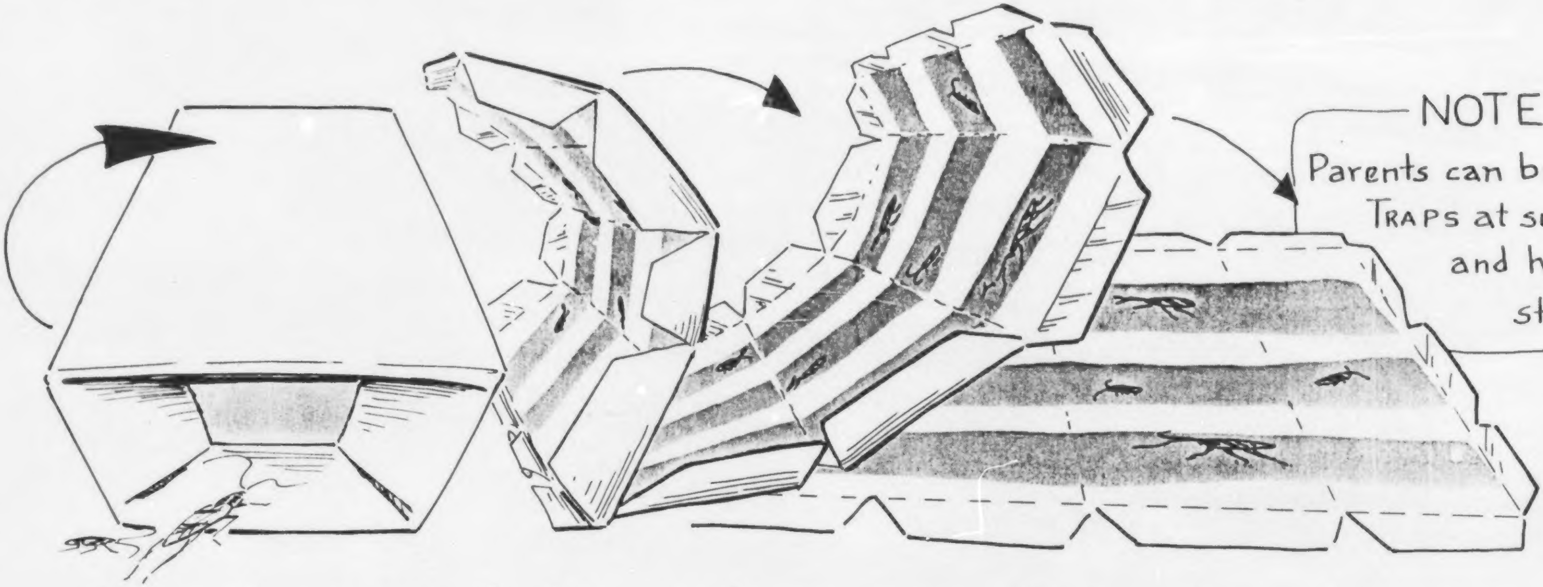


Squash them with
a soapy sponge

Catch them in
cockroach traps!



Cockroach traps help you get rid of roaches after you've removed their food and homes.



NOTE:
Parents can buy ROACH-TRAPS at supermarkets and hardware stores.

Roaches walk in and get stuck in the glue.

You can open the traps and count the roaches.

A lot of roaches caught in one place means you need to do more work there.

BORIC ACID POWDER KILLS ROACHES*

*It only hurts us if we eat it. The powder lies on the ground where we don't breathe it.

Boric Acid sticks to the roaches when they walk through it.

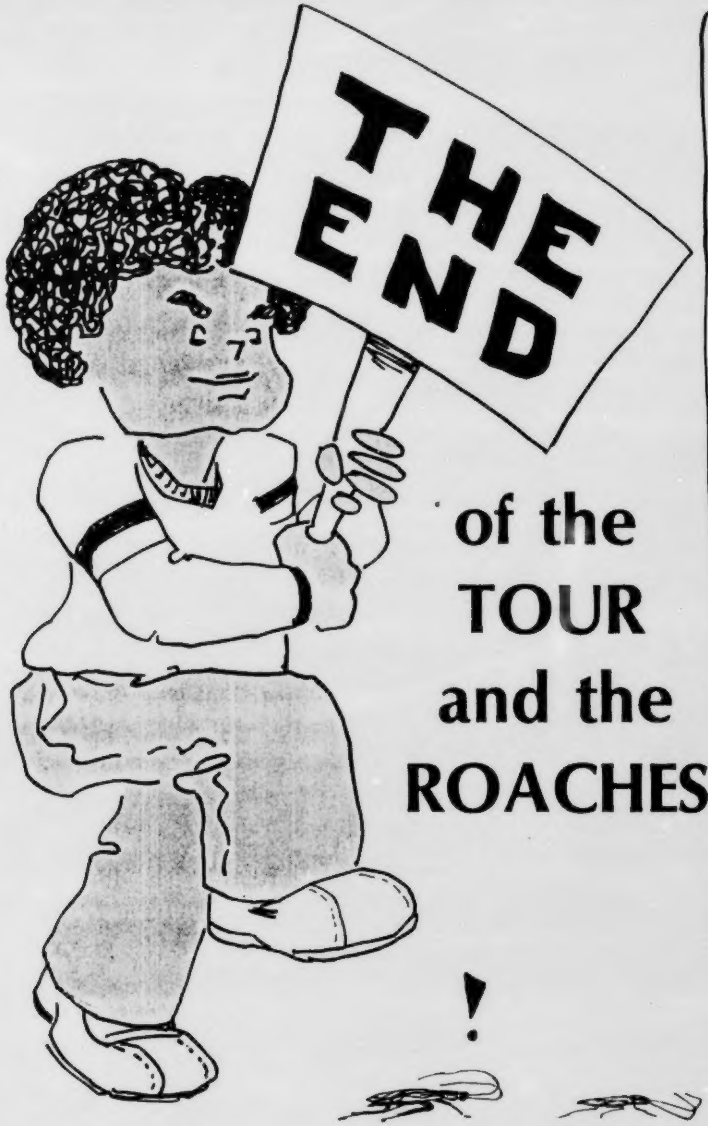
Then they lick the powder off and die.

Grown-ups can sprinkle some Boric Acid in the cracks before closing them up.

Pretty tricky, huh?

More than **ONE** kind of pest can live in a room.

Can you think of a larger animal that might enjoy living in a hole in this room?



of the
TOUR
and the
ROACHES

What can you do to get rid of roaches in your home?

- ☐ Fix water leaks
- ☐ Put away food
- ☐ Put lids on garbage
- ☐ Seal cracks
- ☐ Use roach traps